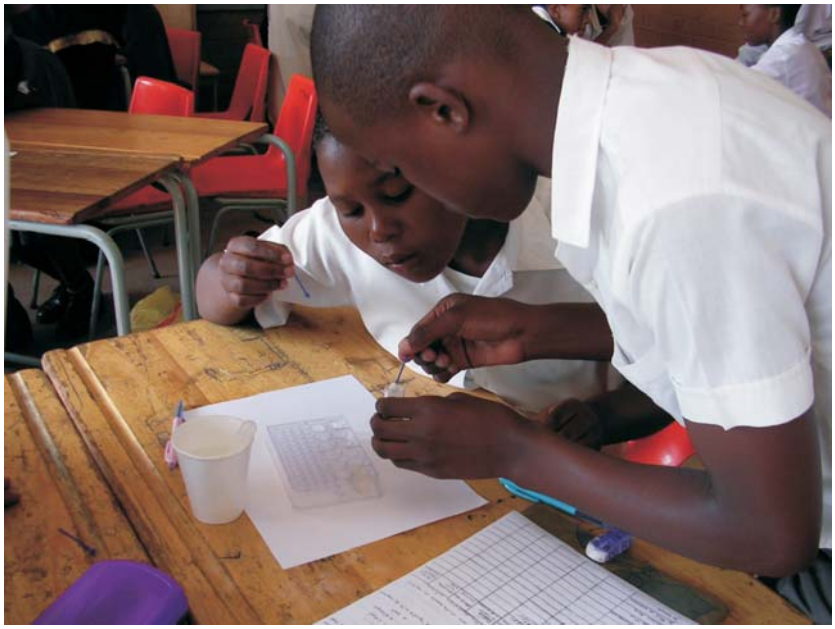
SC/BES/MCS/2006/1
December 2006
Original: English

ADVANCED LEARNING PACKAGES

PRIMARY MICROSCIENCE EXPERIENCES

ENGLISH VERSION
2006



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RADMASTE CENTRE

uscience

UNESCO
United Nations Educational, Scientific and Cultural Organization

Prepared under UNESCO Contract 4500027791

This publication of Primary Microscience Experiences has been prepared in cooperation with UNESCO.

United Nations Educational, Scientific and Cultural Organization

IN COLLABORATION WITH

The Centre for Research and Development in Mathematics, Science and Technology Education (RADMASTE)
University of the Witwatersrand
Johannesburg, South Africa

The UNESCO-Associated Centre for Microscience Experiments
The RADMASTE Centre
University of the Witwatersrand
Johannesburg, South Africa

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ADVANCED LEARNING PACKAGES: PRIMARY MICROSCIENCE EXPERIENCES

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PREFACES

(i) Foreword

All over the world, science educators declare that practical experiences are an essential part of learning science. However, in many countries these experiences are not provided in the majority of their primary and secondary schools. There are several reasons for this: cost, safety, waste disposal and teacher preparation. To help overcome these problems, microchemistry kits and workbooks were designed by the RADMASTE Centre. In cooperation with UNESCO and IUPAC, these have been brought to the attention of secondary school educators in more than 70 countries. This has led to pilot projects and wider implementation in many of these countries.

Another consequence has been the motivation to extend our work into other areas of science, and to other educational levels. The present workbook now introduces the microscience approach to the primary (or elementary) school level.

The primary microscience kits are designed to be easy to use, robust and versatile. They should therefore be useful in all countries, just like the traditional, larger equipment. So students now can do most of the same experiments as students were intended to do before, but more safely and at less cost.

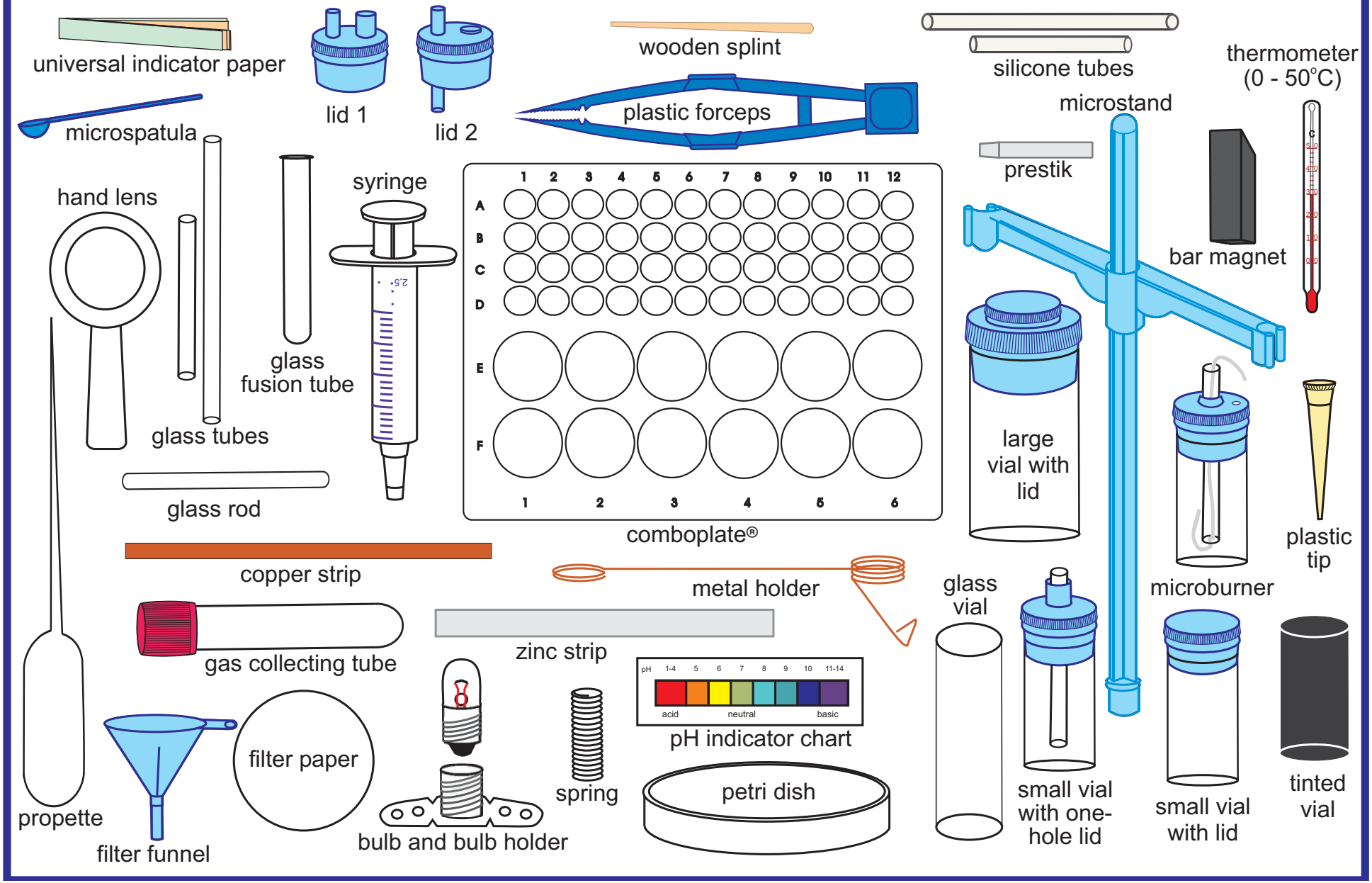
The workbook is a different matter. Each country has its own school curriculum and its own way of delivering that curriculum. Indeed, each teacher is an individual, and in each classroom the story is a little different. This workbook therefore provides a starting point only. The worksheets were originally designed at the RADMASTE Centre, University of the Witwatersrand in South Africa to suit the South African curriculum. Using them, teachers and students in any country should be able to complete successfully a wide range of basic science experiments (biology, chemistry and physics) with the primary microscience kits.

We hope that this experience is enjoyable, and that the teachers will improve and modify the experiments in the light of their experience.

In modern laboratories around the world, science is increasingly done on the small scale. This is because it costs less, is safer and is less damaging to the environment. This workbook can help school science to quickly pick up this trend and make personal experiences accessible to all students. Learning this approach in primary school will ensure that all future citizens have such experiences and lose their fear of science.

Prof J D Bradley
DIRECTOR: RADMASTE Centre
and UNESCO-Associated Centre
for Microscience Experiments

COMPONENTS OF THE RADMASTE PRIMARY MICROSCIENCE KIT



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Activity 1.1 TRACES OF AIR (I)

Focus question: Does air occupy space?

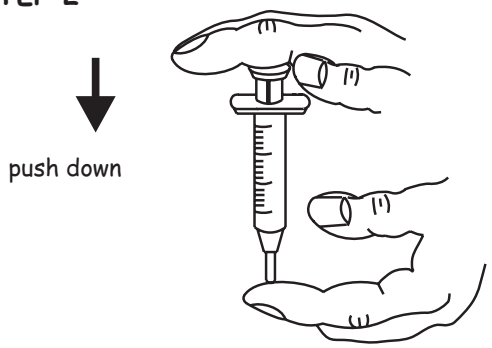
You will need:

- 1 syringe
- 1 sample vial
- water

STEP 1

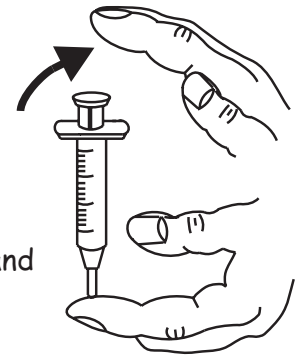
Block the nozzle of the syringe with your finger.

STEP 2



Put the plunger in and press until you cannot press anymore.

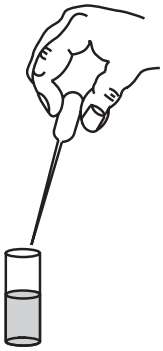
STEP 3



Release the plunger and note what happens.

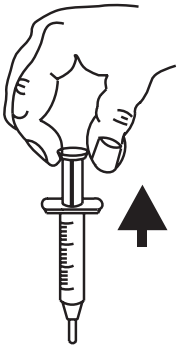
Q1 What is in the syringe?
Q2 Why does the plunger shoot back after being released?
Q3 Can air be compressed or not?

STEP 4



Half fill the sample vial with water.

STEP 5



Pull the plunger halfway out of the syringe.

STEP 6

Insert the syringe into the water in the vial and push the plunger in.

Q4 Why is the water not going into the syringe when you insert it into the water?
Q5 What happens when you push the plunger in?
Q6 What causes the bubbles?
Q7 Does air occupy space? Give reasons for your answer.

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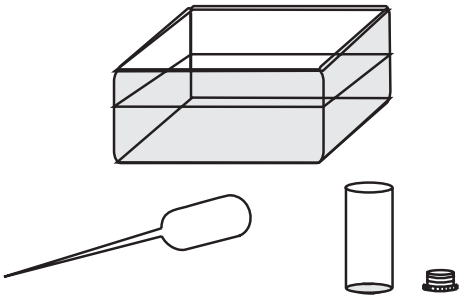
Activity 1.2 TRACES OF AIR (II)

Focus question: Does air occupy space?

You will need:

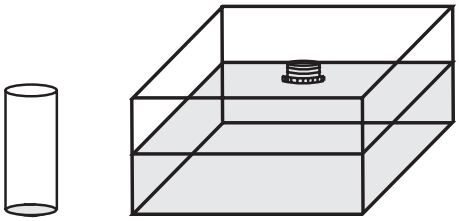
- 1 large sample vial
- lunch box
- 1 propette
- water
- 1 plastic lid (for small sample vial)

STEP 1



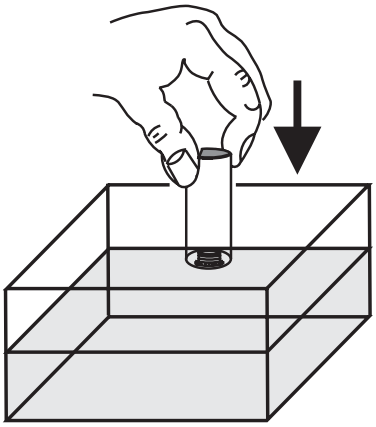
Fill the lunch box to 2/3 with water and let the water settle.

STEP 2



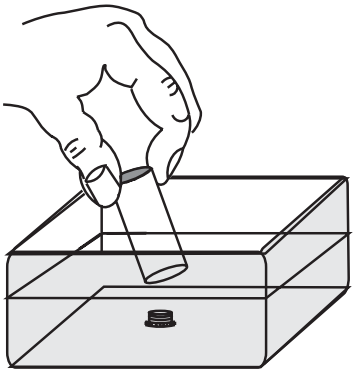
Place the lid in the water on the floor of the lunch box.
Q1 What happens to the lid?

STEP 3



Hold the sample vial upside down and push it over the lid into the water until it touches the floor of the lunch box.
Q2 What happens?
Q3 Why is this happening?

STEP 4



Repeat steps 2 and 3 again and.....

....tilt the vial slightly and note what happens.
Q4 Describe what you see.
Q5 What causes the bubbles?

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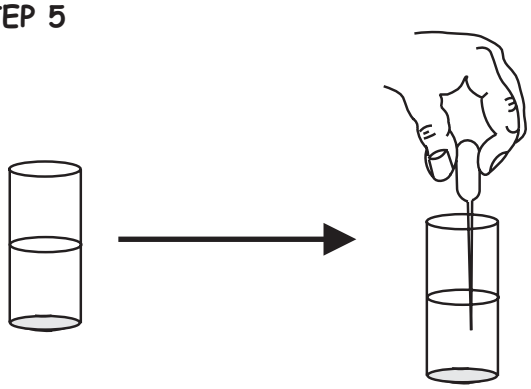
STEP 5



Half fill the sample vial with water. Insert the tip of the propette into the water.

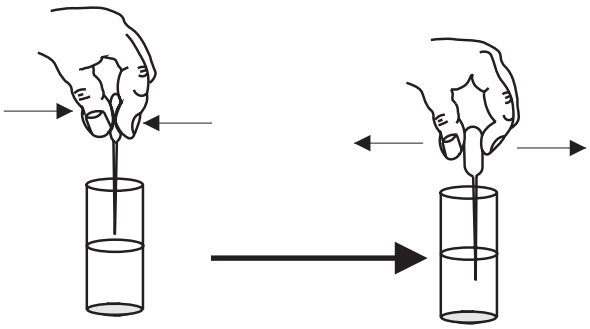
Q6 What happens?

Q7 Is the water entering the propette?

Q8 What is inside the propette?

Take the propette out.

STEP 6



Squeeze the bulb and insert the tip of the propette into the water and then release the bulb.

Q9 What happens?

Q10 Why did the water not enter the propette in step 5?

Q11 Why is the water entering the propette now?

Q12 Does air occupy space?

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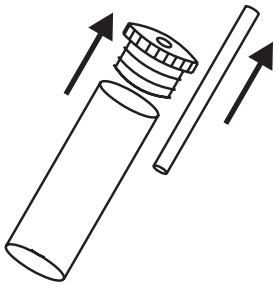
Activity 1.3 IS AIR MATTER?

Focus question: Does air occupy space?

You will need:

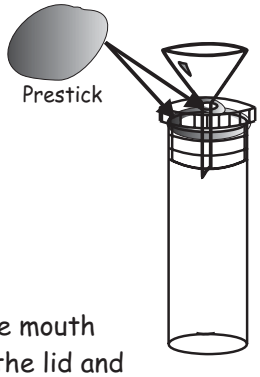
- 1 comboplate
- 1 small vial with a single hole lid
- 1 propette
- 1 microfunnel
- prestick
- water

STEP 1



Take the oil dropper vial, open the lid and remove the glass tube from the hole. (**Make sure that the vial is not the microburner**.)

STEP 2



Use prestick to seal the mouth of the vial tightly with the lid and the hole of the lid tightly with the microfunnel.

STEP 3

Use a propette to put water into the funnel.

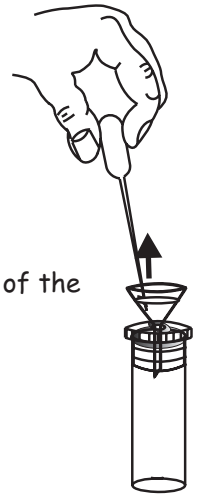
Q1 What do you observe?
Q2 Why is the water not passing into the vial?

STEP 4

Insert the stem of the propette through the hole of the funnel into the vial.

Q3 What happens?

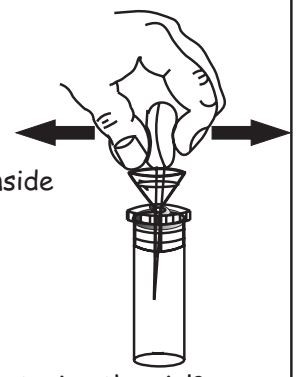
STEP 5



Gently remove the stem of the propette by pulling the propette out.

Squeeze the bulb of the propette and ...

STEP 6



...insert the stem of the squeezed propette through the funnel again. Once the tip of the stem is inside the vial, release the bulb.

Q4 What do you observe?
Q5 Why is this happening?
Q6 Why was the water not entering the vial?
Q7 Does air occupy space? Explain your answer.
Q8 Complete the concept map of air in the next page.

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Activity 1.4 DIRECTION GAME

Focus Question: Instill the sense of direction, numeracy skills and recording skills.

What you need:

- 2 pencils
- rubber
- 2 players

How to play:

1. One of the players (P1) secretly choose a square on the chart, identify it by the number of the column (X) and the number of the row (Y) that is x,y e.g the choice 3,4 implies that the square is in column 3 and row 4.
2. The choice is recorded (written) under choice below.
3. The other player (P2) picks any square on the game board to start the game.
4. Record (write) the choice of P2 under guess 1 on the table below.
5. P1 should then give P2 a clue of which direction to take, to reach the correct square e.g NW (move in the north west direction).
6. This should be recorded under clue 1 in the table below.
7. There are only 6 chances in each cycle and then the game is over.
8. Each chance has a value and the faster one arrives at the correct square without many clues, the higher the value.
9. The winner is determined after each player had 4 chances to play and therefore has 4 values.
10. The winner is the one with the highest score when the 4 values are added together.

Choice _____

Table (a)

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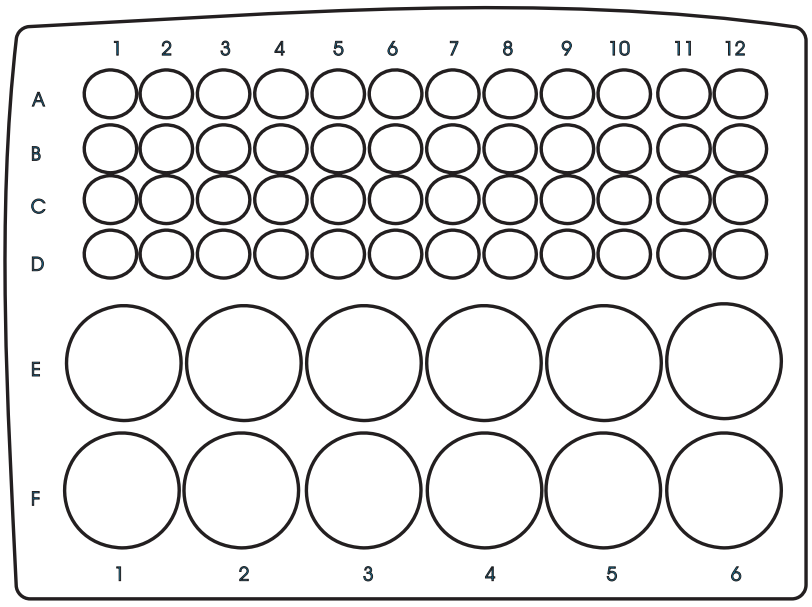
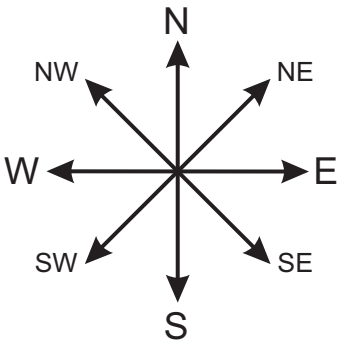
Activity 1.4: Direction Game (continued)





Table(b): Value of Each Chance Required to Reach the Correct Position

Chance	1	2	3	4	5	6	7	8
Value	7	6	5	4	3	2	1	0

Choice: _____

Table (c):

Chance	Clue	Guess (well)	Value
0	start		8
1			
2			
3			
4			
5			
6			
7			
8			
		TOTAL	

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Activity 1.5 USING A SHADOW TO DETERMINE MAIN DIRECTIONS

Focus question: In which direction does the sun rise and set?

You will need:

- 1 comboplate
- 1 ruler
- 1 microstand
- soft or sandy soil
- A sunny place

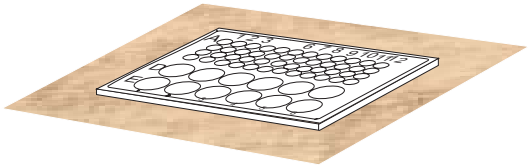
STEP 1

Together with your teacher and your team mates, find a sunny place with soft or sandy ground outside your classroom.

STEP 2

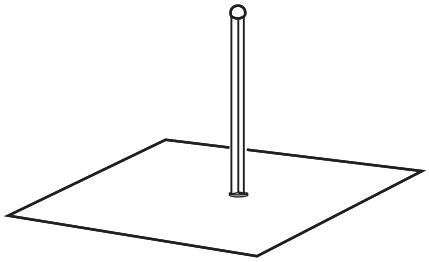
Find a spot at least 1 metre away from your friends' spots

STEP 3



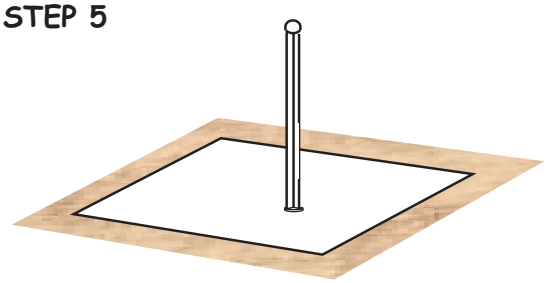
Embed your comboplate firmly in the soil on your spot.

STEP 4



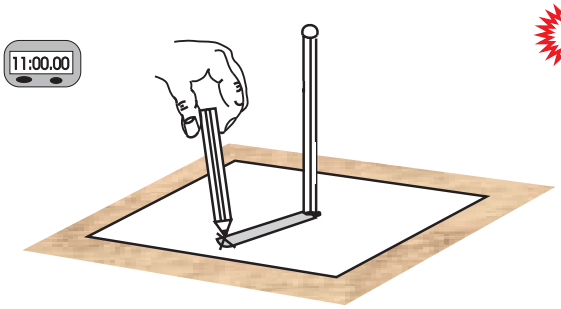
Fit the base of your microstand stem into the centre of a blank page.

STEP 5



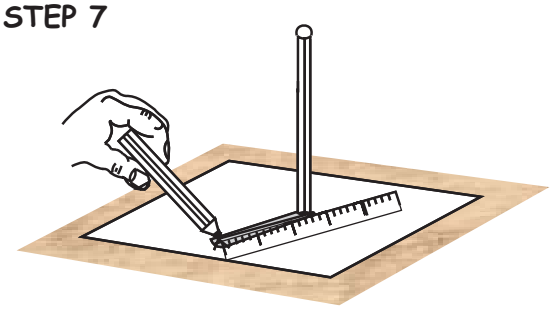
Insert the stem together with blank page in well D6 of the comboplate so that the page covers the comboplate.

STEP 6



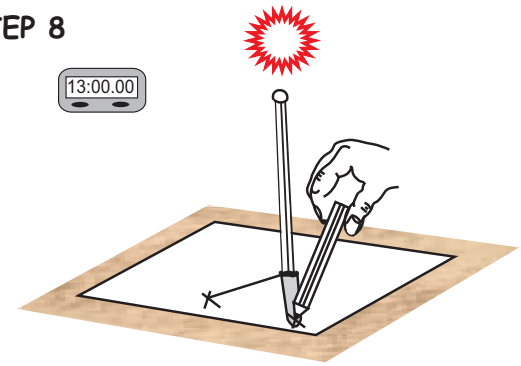
At 11h 00 mark off the shadow of the stem.

STEP 7



Use a ruler and a marker to draw a line along the shadow on the page.

STEP 8



At 13h00 repeat step 6.

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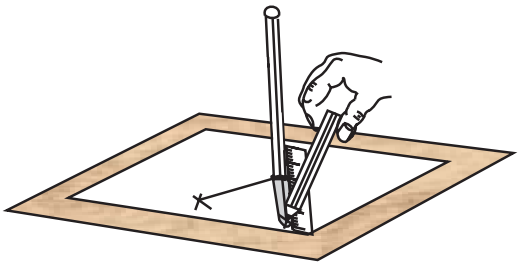
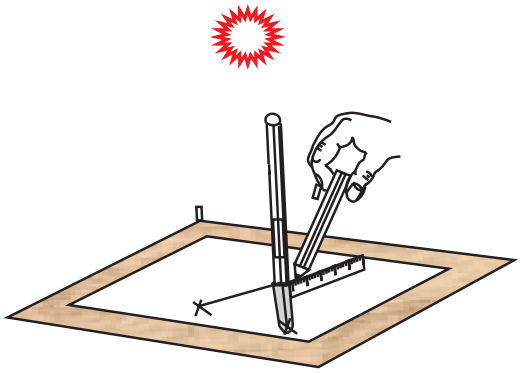
STEP 9



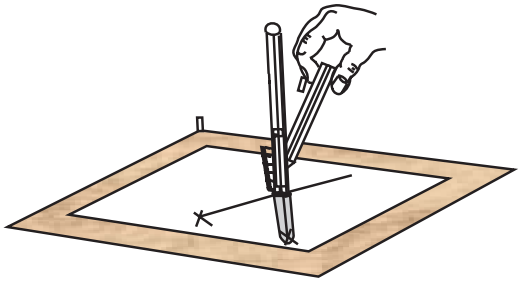
Draw a line along the shadow on the page using a ruler.

STEP 10



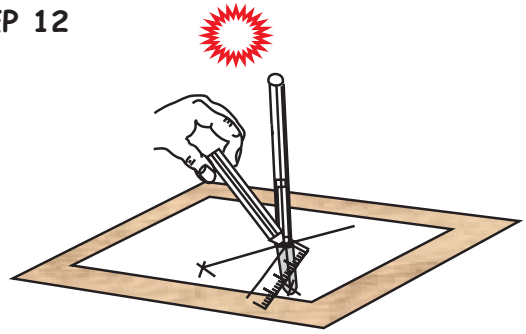
Extend the first shadow line backwards.

STEP 11



Extend the second shadow line backwards.

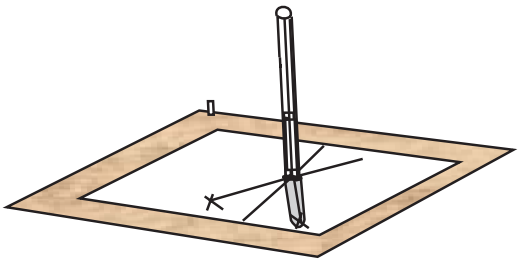
STEP 12



Draw a line exactly in between the shadow lines. This line will point south. Extend the line backwards to find north.

Q1 How can you find east and west?

STEP 13



Draw a line in your plot pointing in the east-west direction.

STEP 14

Compare your main directions with those of your mates.

Q2 In which direction is your favourite friend's plot from yours?

Q3 Whose plots are to the north and which are to the east of your plot?

Q4 In which direction is your classroom in relation to your plot?

Q5 Name two things which are to the south-west of your plot.

Q6 In which direction is your home?

Q7 In which direction does the sun rise and set?

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Activity 1.6 MAKING A WIND VANE

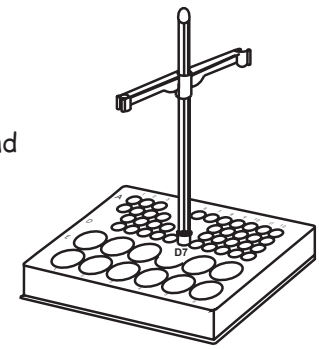
Focus question: How can we find out in which direction the wind is blowing?

You will need:

- 1 comboplate
- 1 compass
- 1 straw
- 1 pair of scissors
- 1 thin card
- 2 x microstands
- 1 propette
- 1 drawing pin
- glue
- prestik

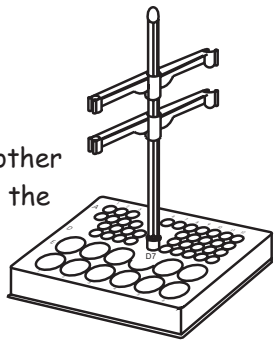
STEP 1

Insert a microstand into well D7.

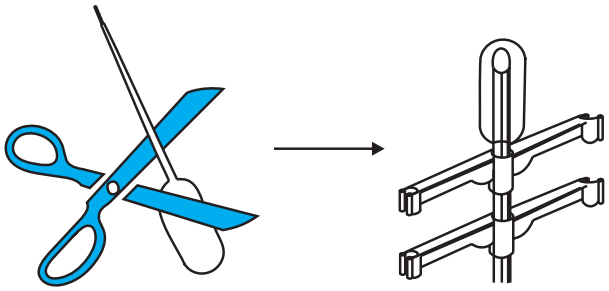


STEP 2

Remove a side arm from another microstand and attach it to the microstand in D7.

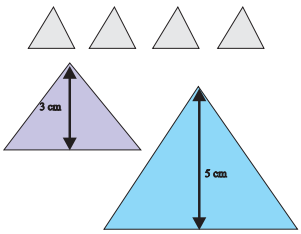


STEP 3



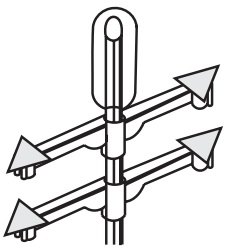
Cut off the stem of the propette at the base of the propette bulb. The hole should be large enough to be able to fit the bulb over the microstand stem.

STEP 4



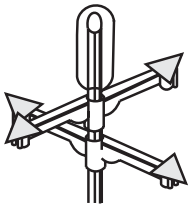
Cut four small triangles out of the card. Then cut out a triangle about 3 cm in height and a bigger one, about 5 cm in height.

STEP 5



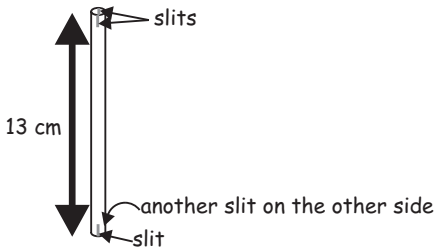
Attach the four small triangles to the upper side of the ends of the two side arms with prestik.

STEP 6



Rotate the arms so that they form a cross with the four triangles pointing in four different directions.

STEP 7



Cut off a 13 cm piece of straw and make a slit on both sides of each end of the straw.

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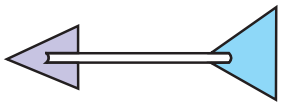
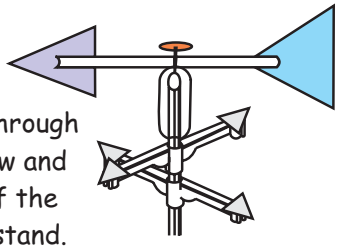
STEP 8



Slot the two big triangles into the slits pointing in the same direction.

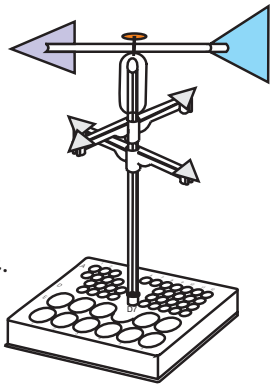
STEP 9



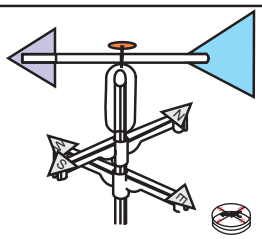
Push the drawing pin through the centre of the straw and then into the centre of the propette on the microstand.

STEP 10

Stand the wind vane outside on a flat surface.



STEP 11



Use a compass to position the microstand so that one of the triangles points north and mark it N (north). Mark the opposite arrow S (south), and the other two E (east) and W (west).

STEP 12

Record the wind direction daily for a week at 9:00 and at 12:00.

STEP 13

Record your findings in the table provided.

Table 4.5

Day	Time	Short description of the day e.g sunny and warm	Wind direction
1			
2			
3			
4			
5			
6			

Q1 What was the wind direction on day 3 at 9:00?

Q2 What do you conclude from your observations?

Q3 Name things which are in the north direction from your classroom.

Q4 Where does the sun rise?

Q5 Where does the sun set?

Q6 In which direction is the play ground from your classroom?

Q7 In which part (N,S,E & W) of town (village) is your school?

Q8 What conclusions can you make from the wind observations in your table?

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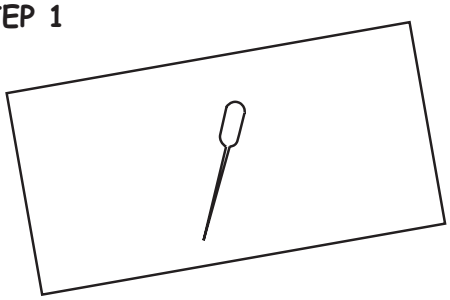
Activity 1.7 AIR CAN DO WORK

Focus question: Can air move things?

You will need:

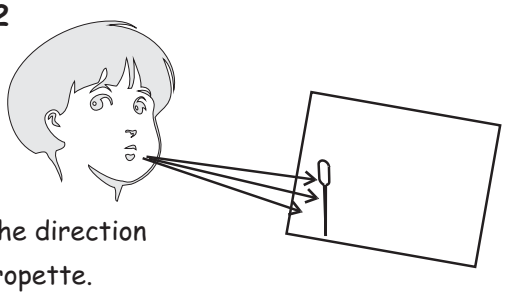
- 1 comboplate
- 1 microstand
- 1 propette
- prestik

STEP 1



Place a propette on your table.

STEP 2

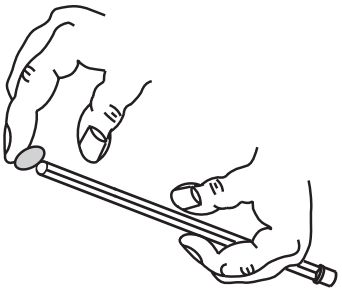


Blow in the direction of the propette.

Q1 What happens?

Q2 What can happen to the propette if it is exposed to wind blowing in the south direction?

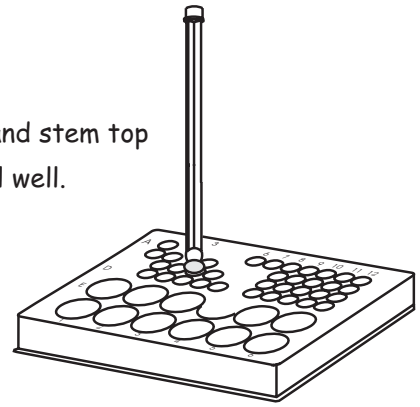
STEP 3



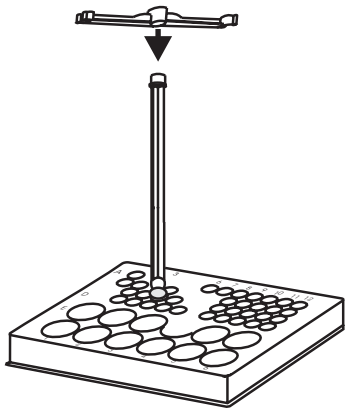
Put a piece of prestik on the top end of microstand stem.

STEP 4

Put the microstand stem top down into a small well.

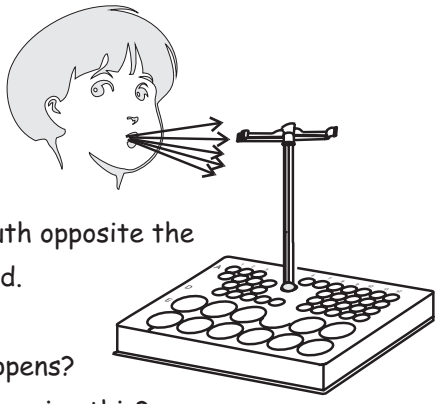


STEP 5



Insert the arm of the microstand upside down onto the end of the stem.

STEP 6



Position your mouth opposite the arm and blow hard.

Q3 What happens?

Q4 What is causing this?

Q5 What would happen if you were to place this system outside during a windy day?

Q6 Can air move things?

Q7 Is your guess in Q5 correct or not?

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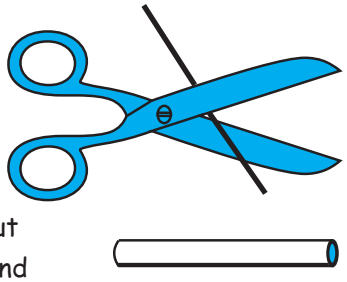
Activity 1.8 THE AIR PUMP ON MY COMBOPLATE

Focus question: How does the bicycle pump work?

You will need:

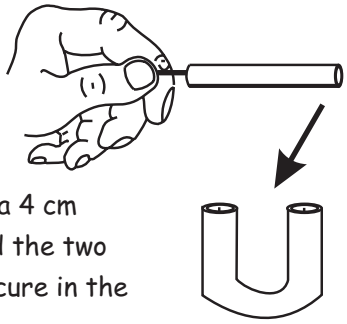
- 1 comboplate
- 1 syringe
- 1 silicone tube (4 cm)
- 1 lid 2
- 1 propette
- 1 paper clip
- 1 pair of scissors

STEP 1



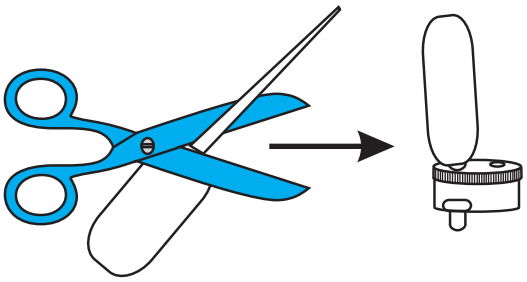
Straighten out a paper clip and cut off a 3.5 cm piece.

STEP 2



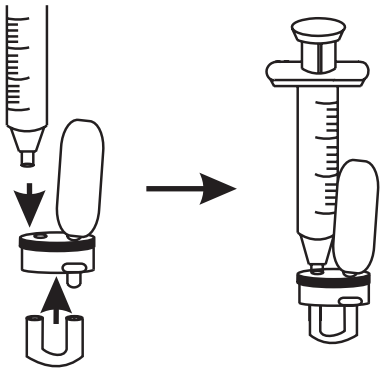
Insert the piece into a 4 cm silicone tube and bend the two so that the wire is secure in the tube.

STEP 3



Cut off the stem of a propette and insert the bulb tightly into the protruding hole of lid 2.

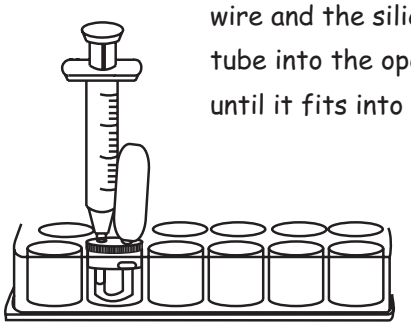
STEP 4



Insert the syringe into the other hole of the lid. Close the openings of the underside of the lid with the silicone tube.

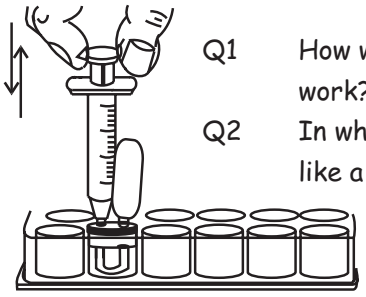
STEP 5

Fit the lid into one of the large wells. If the lid does not fit in the well, push the wire and the silicone tube into the opening until it fits into the well.



STEP 6

Use the syringe as a pump and see what happens.



Q1 How well does the pump work?

Q2 In what ways does it work like a bicycle pump?

Q3 Why does the bulb deflate when you pull the plunger out?

Q4 How does it differ from a bicycle pump?

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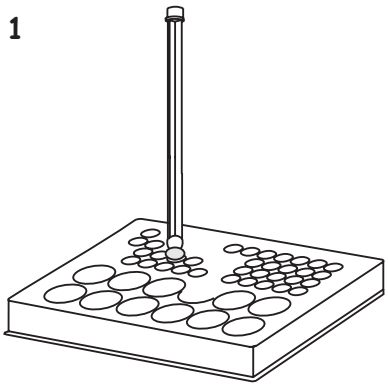
Activity 1.9 WHAT IS MOVING THE PROPETTE ON MY PETRI DISH?

Focus question: Can water move things?

You will need:

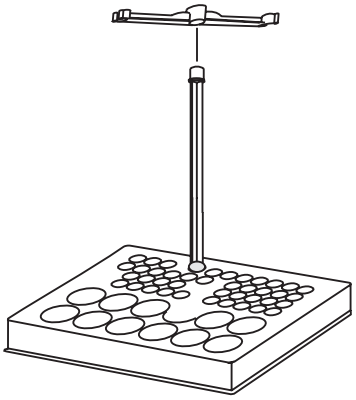
- 1 comboplate
- 1 Petri dish
- 1 micro stand
- prestik
- 1 propette
- water

STEP 1



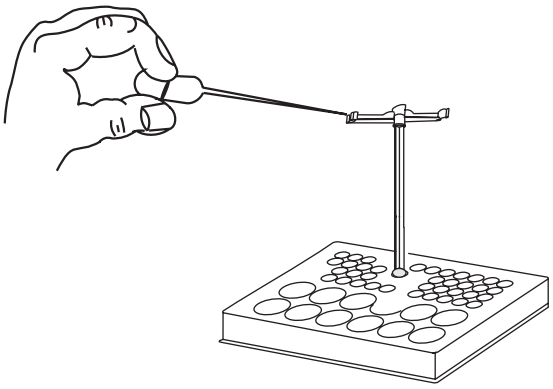
Put a piece of prestik on the top end of a microstand and put the stem into a small well of the comboplate.

STEP 2



Insert the arm of the microstand upside down onto the end of the stem.

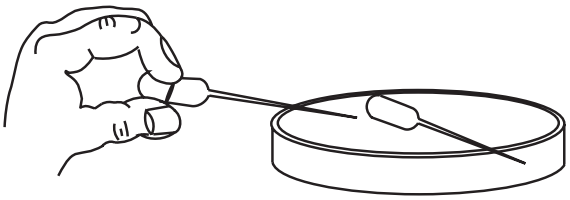
STEP 3



Fill a propette with water and jet the water at the arm of the microstand.

Q1 What happens?
Q2 What is causing this?
Q3 Is there work done in this instance?

STEP 4



Place one propette in the centre of a Petri dish and spray its side with water from another propette.

Q4 What happens to the propette?
Q5 What is actually moving the propette?
Q6 What is moving the water in the Petri dish? Can water do work?

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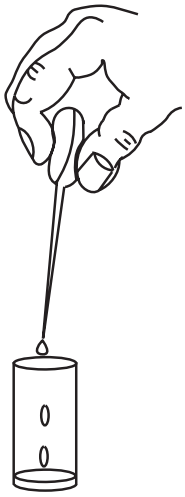
Activity 1.10 HOW FAST IS THE WATER MOVING UP?

Focus question: Where and how do the leaves of a very high tree get water?

You will need

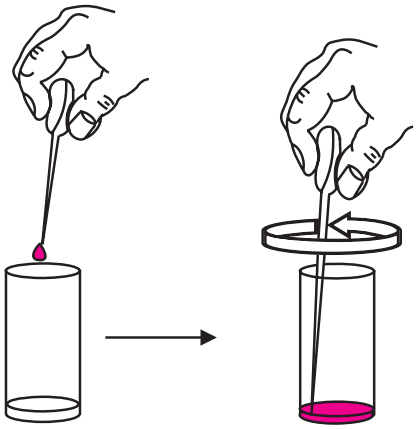
- 1 sample vial
- 1 propette
- filter paper
- food colouring
- 1 pair of scissors
- 1 ruler
- 1 stop watch
- water

STEP 1



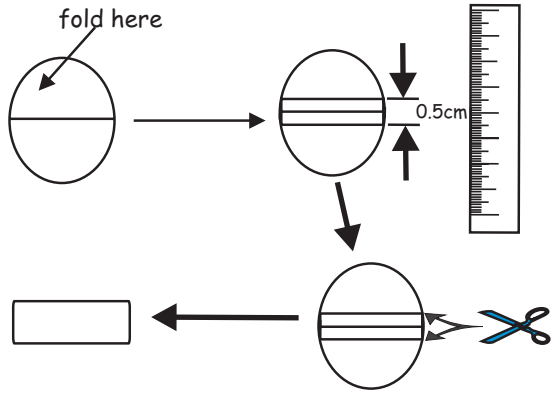
Use a propette to put 12 drops of water into the vial.

STEP 2



Add three drops of food colouring and stir the mixture with the tip of a propette.

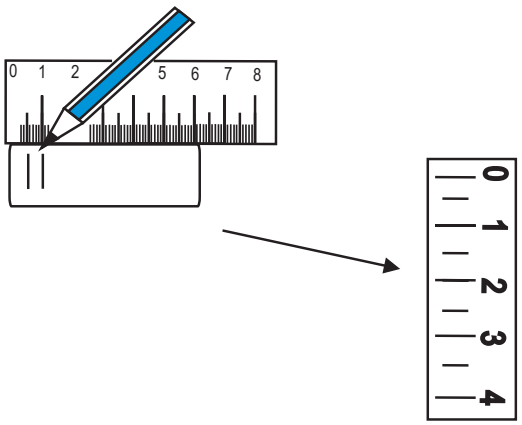
STEP 3



Fold the filter paper in half and open up.

Draw two lines 0.5cm apart in the middle of the filter paper and make a strip by cutting along the lines you have drawn.

STEP 4



On this strip mark 0.5 cm; 1 cm; 1.5 cm; 2 cm; 2.5 cm; 3 cm; 3.5 cm; 4 cm using a ruler.

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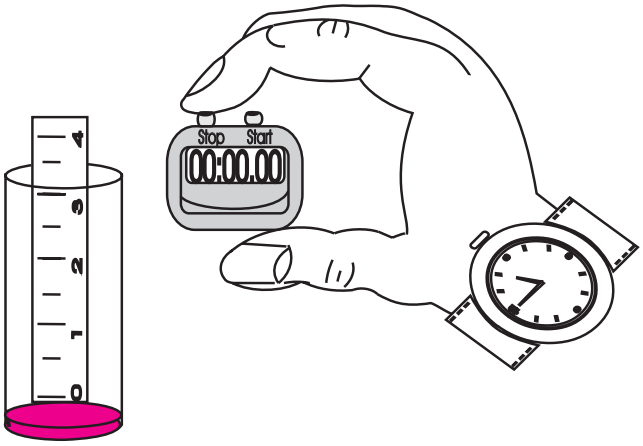
STEP 5



Put the paper strip in the vial with the coloured mixture and start the stop watch immediately. Observe and record the time it takes the solution to reach 1cm; 2cm; 3cm; 4cm and the top, on the table below.

Table 1

Height in cm	Time in seconds
1	
2	
3	
4	
top	

Answer the following questions:

Q1 What happened in step 5?

Q2 How long did it take the water to reach a height of 2 cm?

Q3 What was the height of the water in 30 seconds' time?

Q4 How long did it take the water to reach the top of the paper?

Q5 Where do the leaves of a very tall tree get water?

Q6 How do these leaves get the water?

Q7 Why is the water able to reach the top of the paper?

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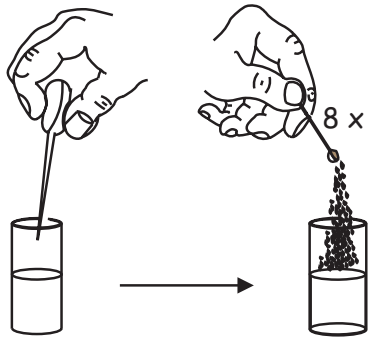
Activity 1.11 MUDDY,MUDDY WATER: CAN WE MAKE IT SAFE TO DRINK?

Focus question: How is the water purified and which household cleaner can be used to kill germs in water?

You will need:

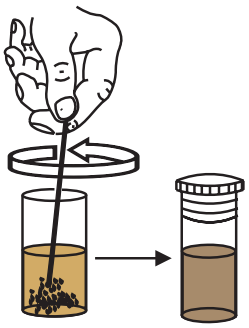
- 2 vials with lids
- 1 microspatula
- 1 propette
- 1 microfunnel
- filter paper
- chlorine water
- soil
- water

STEP 1



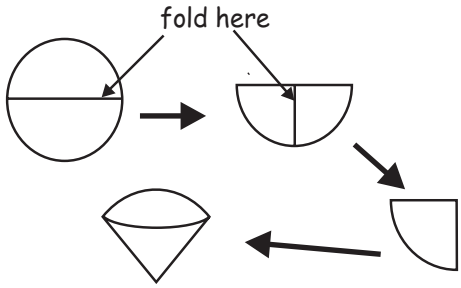
Make a mixture of soil and water by half filling the vial with water and then adding 8 microspatulas of soil to it.

STEP 2



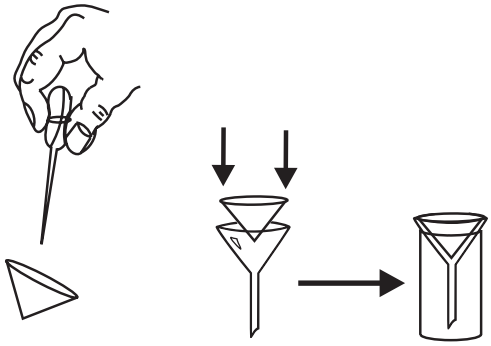
Mix with the end of the microspatula and close the vial with a lid.

STEP 3



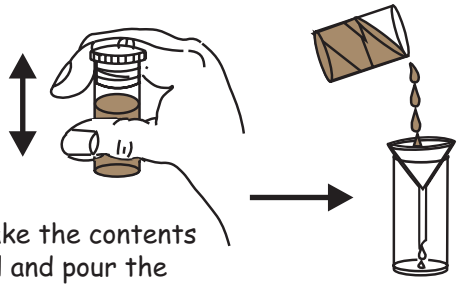
Follow the steps shown to fold the filter paper properly.

STEP 4



Wet the filter paper with a few drops of water and fit it into the microfunnel.

STEP 5

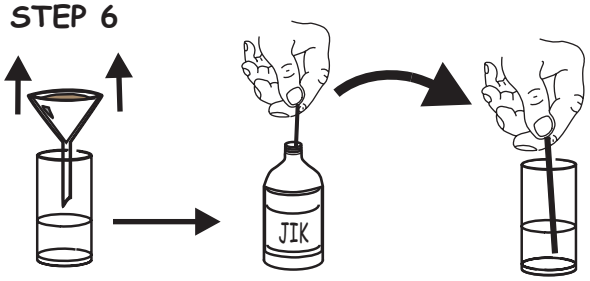


First shake the contents in the vial and pour the muddy water carefully into the microfunnel.

Q1 What does the water look like which drips through?

Q2 Do you think the water is pure enough for drinking?

STEP 6



Remove the funnel when all the water has dripped through. Dip a tip of a microspatula into chlorine water. Then dip the tip into the water in the vial.

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Q3 Which substance is used to purify water in swimming pools?

Q4 What do you think Jik is used for in this activity?

Q5 What does 'to purify' mean?

Q6 What is the method of separation used in this activity?

Extension questions:

Q7 Where does the water we drink come from?

Q8 What happens to the water in our sewerage system? Is it disposed of in some place or is it cleaned and reused again?

Q9 How is the water purified and which household substance can be used to kill germs in water?

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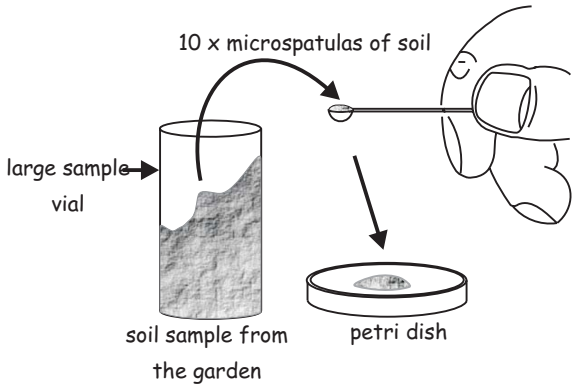
Activity 1.12 WHAT FORMS SOIL ?

Focus Question: What does soil contain?

You will need:

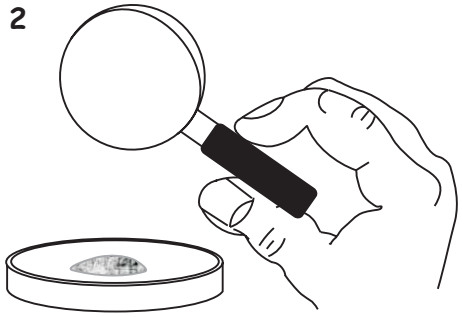
- comboplate
- microburner
- microspatula
- petri dish
- large and small sample vials
- glass fusion tube
- metal tube holder
- magnifying glass
- soil sample

STEP 1



Use a large sample vial to collect a soil sample from the garden.
Put 10 microspatulas full of soil in the petri dish.

STEP 2



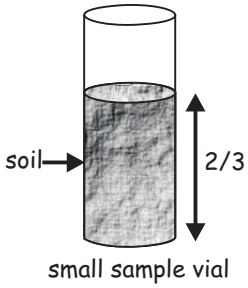
Use the magnifying glass to study the soil sample.

Q1 What do you see?

Q2 Are there living things in the soil. Explain.

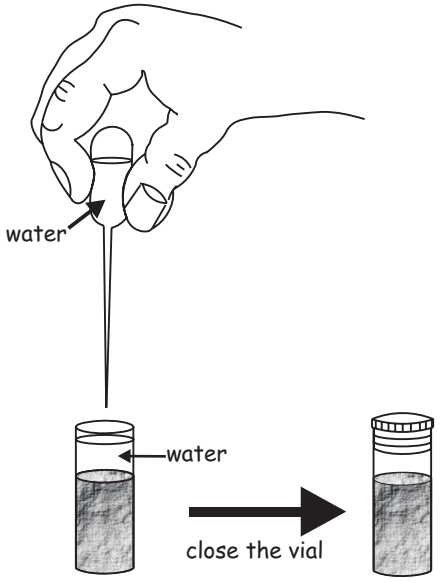
Q3 Make drawings of all the things you see and label them.

STEP 3



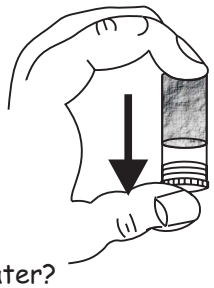
Fill two thirds of the small sample vial (which has a lid) with the soil.

STEP 4



Add water to just about fill the vial and close the vial with the lid.

STEP 5



Tilt the vial gently upside down while observing.

Q4 What happens when the soil mixes with water?

Q5 What do you know when you see bubbles in the water?

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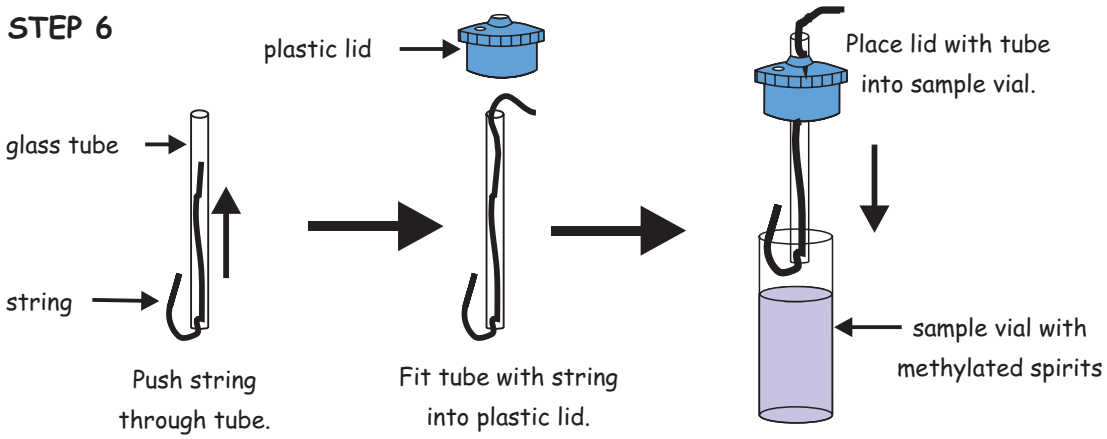
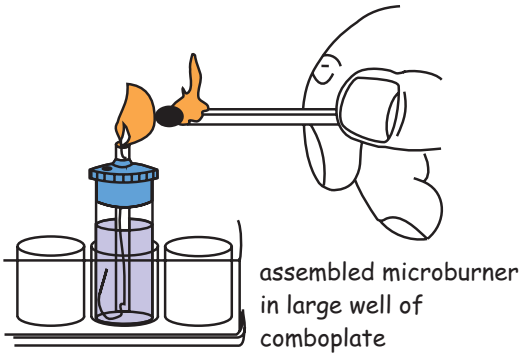
STEP 6



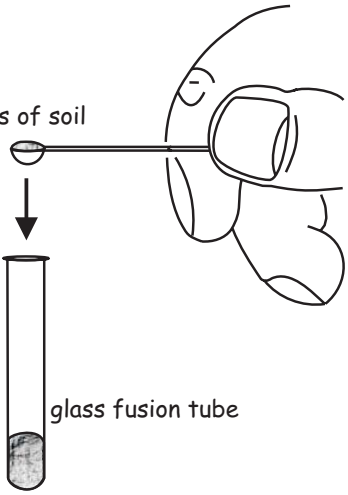
Assemble the microburner and add methylated spirits.

STEP 7

Put the microburner in one of the large wells of the comboplate and light it.



STEP 8



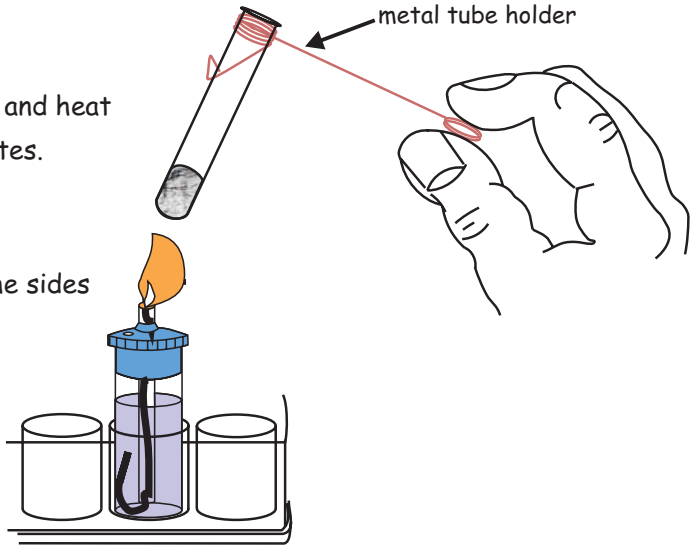
Put 10 microspatulas of soil into the fusion tube.

STEP 9

Hold the tube with a metal tube holder and heat the tube with the flame for a few minutes. Observe what happens.

Q6 What do you see accumulating on the sides of the tube?

Q7 What does soil contain?



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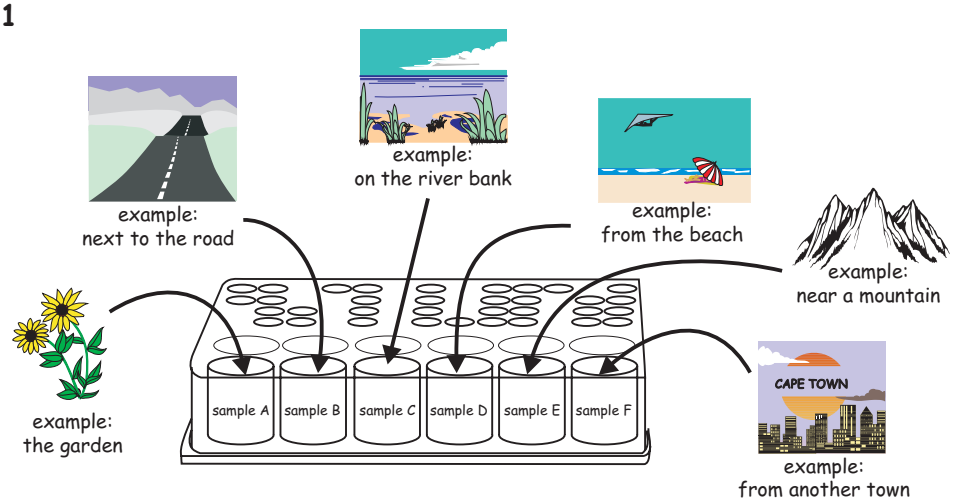
Activity 1.13 IS SOIL THE SAME EVERYWHERE?

Focus Question: What are the main types of soil?

You will need:

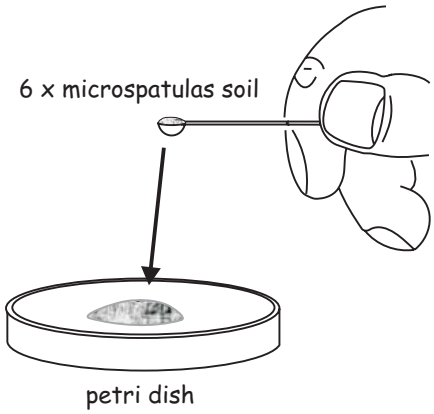
- comboplate
- microspatula
- petri dish
- magnifying glass
- different types of soil samples

STEP 1



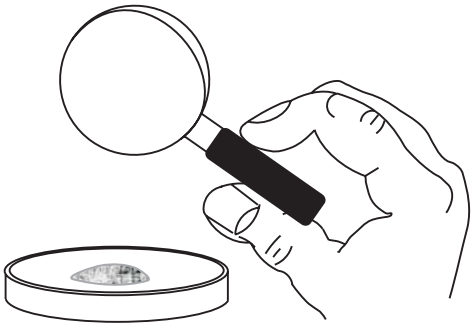
Collect as many different types of soil samples as possible (from the garden, next to the road, on the river bank, from the beach, near a mountain, from another town). Put each sample into one of the large wells of the comboplate.

STEP 2



Use a microspatula to put 6 scoops of one soil sample into the petri dish.

STEP 3



Use the magnifying glass to study the soil sample. Write a description of what you see in a table like the one on the next page.

STEP 4

Put the soil back in the well and repeat steps 2 and 3 with all other soil samples.

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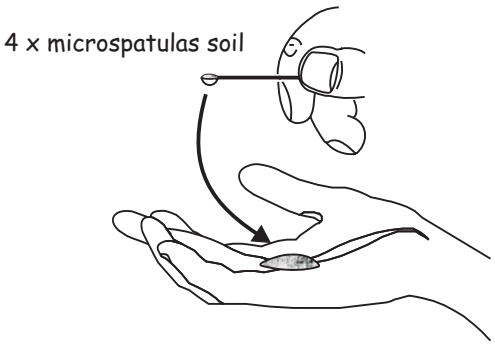
Sample	Soil Description	Good/Bad Garden Soil
A		
B		
C		
D		
E		
F		

Q1 Which soil sample do you think is a very good garden soil? State your reasons.

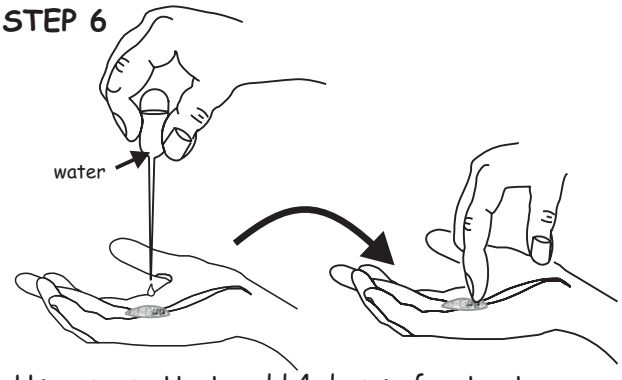
Q2 What other things did you see in your soil samples?

STEP 5



Use a microspatula to put 4 scoops of one soil sample on the palm of your hand.

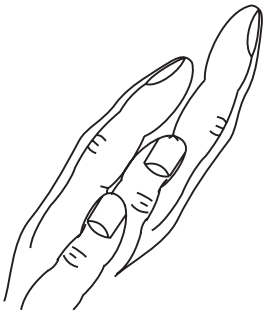
STEP 6



Use a propette to add 4 drops of water to your soil. Rub the mixture with one finger to make mud.

Q3 How does the mud feel on your hand?

STEP 7



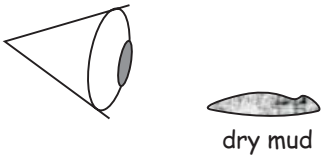
Squeeze out as much water as you can and try to roll the mud between the palms of your hands.

Q4 Note what happens.

STEP 8

Repeat steps 5 to 7 with the rest of the soil samples.

STEP 9



Leave the mud of each soil sample overnight to dry. Observe and describe the mud.

Q5 Use the soil type chart to classify the soil samples. Which soil samples have some features of each type?

Q6 From the chart, none of the three types of soil provides good mineral flow for plants. Explain why each type fails.

Q7 What if the soil is a combination of these three types of soil? Do you think it can provide good mineral flow? Give reasons.

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Activity 1.14 IS IT A CLAYEY OR A SANDY SOIL?

Focus Question: Which soil has a greater water retention?

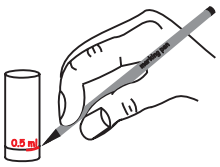
You will need:

- comboplate
- 2 microstands
- stop watch
- piece of cotton wool
- 2 small vials
- 2 propettes
- 2 funnels
- 2 soil samples (A & B)
- marking pen (permanent marker)
- water

STEP 1 Put a scale on two of the small sample vials. To do this:

a) draw 0.5 ml of water into a syringe.

b) push the plunger in to put all the water into a small vial.

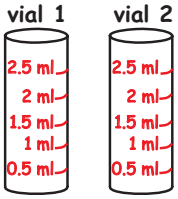


c) use a marking pen to mark the level of the water in the vial and label the water level 0.5 ml.

d) Repeat a) to c) and label the next water level 1 ml.

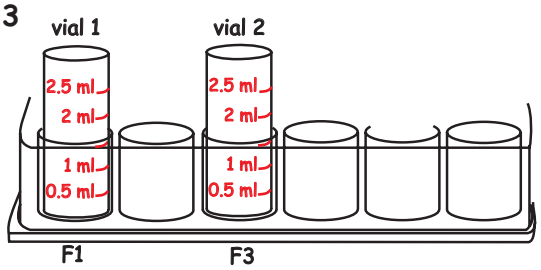
e) Repeat this another three times and therefore mark 1.5 ml, 2ml and 2.5 ml.

STEP 2



Repeat steps 1 a) to e) using the second vial. Empty the water from each vial.

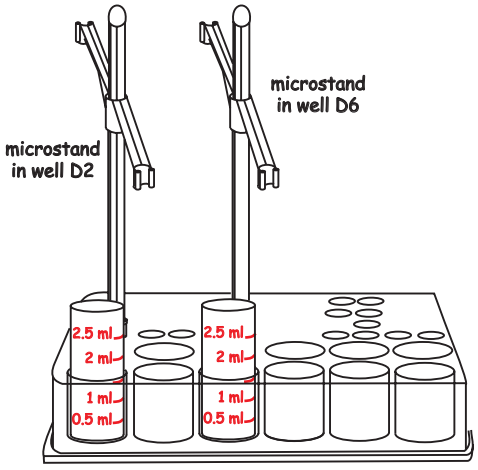
STEP 3



Place one of the vials into well F1 and the other in well F3.

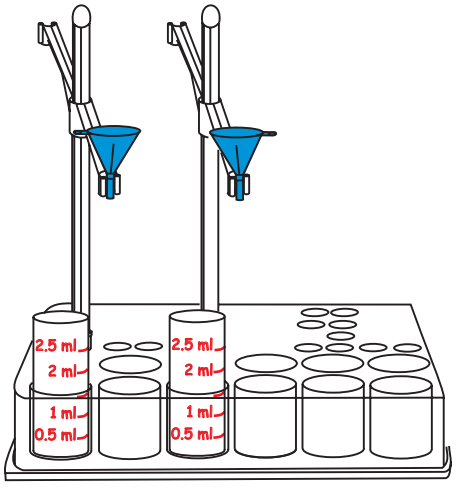
STEP 4

Insert one microstand into well D2 and the other into well D6.



STEP 5

Clamp one funnel to one side arm of each microstand.



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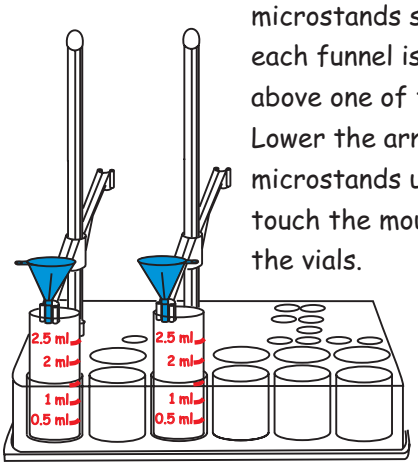
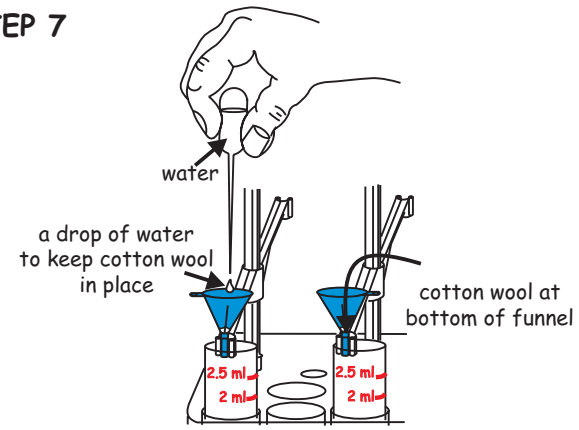
STEP 6

Move the arm of the microstands such that each funnel is directly above one of the vials. Lower the arms of the microstands until they touch the mouths of the vials.

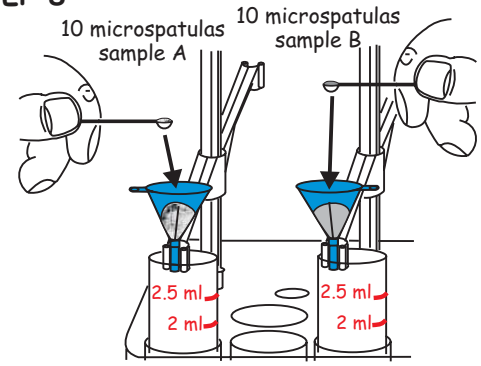


STEP 7



Put thin equal,very small pieces of cotton wool at the bottom of each funnel and add a drop of water with a propette to keep them intact.

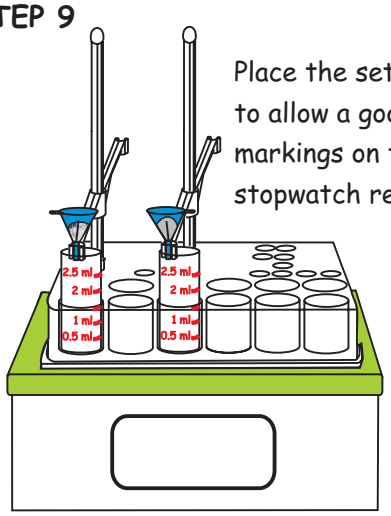
STEP 8



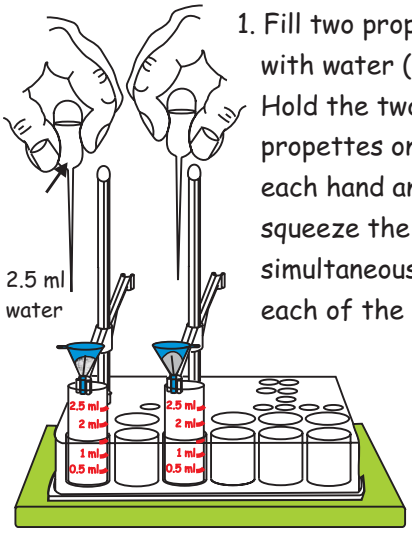
Add 10 microspatulas full of soil sample A into one funnel and 10 microspatulas of soil sample B into the other funnel.

STEP 9

Place the set-up on a lunch box to allow a good view of the markings on the vials. Get the stopwatch ready.



STEP 10



1. Fill two propettes with water (2.5 ml). Hold the two propettes one in each hand and squeeze the water simultaneously into each of the funnels.

2. Now start the stop watch immediately and note what happens against time.

STEP 11

Observe and record the time it takes for 0.5 ml, 1.0 ml, 1.5 ml and 2.0 ml of water to drip through in each case. Record your findings in a table like the one below:

volume (ml) of water dripping	time (sec) taken for sample A	time (sec) taken for sample B
0.5		
1.0		
1.5		
2.0		

Q1 Explain your results.

Q2 Which sample is a clayey and which is a sandy soil? Give reasons for your answer.

Q3 How long did it take for 2 ml of water to drip through in each case?

Q4 Draw a volume versus time graph for each sample to represent your findings.

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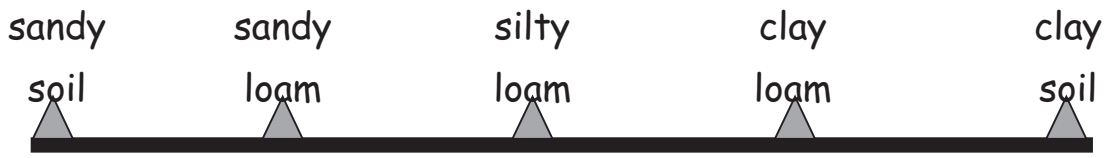
Activity 1.15 WHAT TYPE OF SOIL DO YOU HAVE?

You have identified the main inorganic parts of soil which are coarse sand, fine sand (silt) and clay. The amounts of sand, silt and clay in soil determine which type of soil it is.

The scale below shows a range of soils. At the one end the soil is sandy and at the other end it is clay. A mixture of sand, silt and clay gives us a loamy soil. Again the loamy soil can be different depending on the mix of the soil particles. A loamy soil is the best soil for plants to grow in.

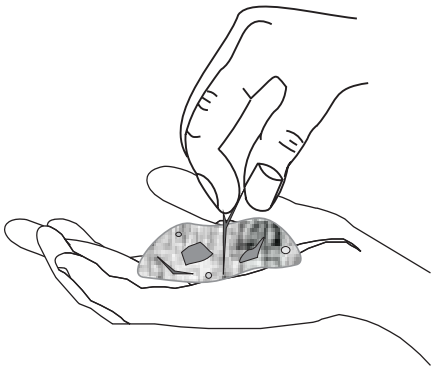


You will need:

- a sample of soil
- water

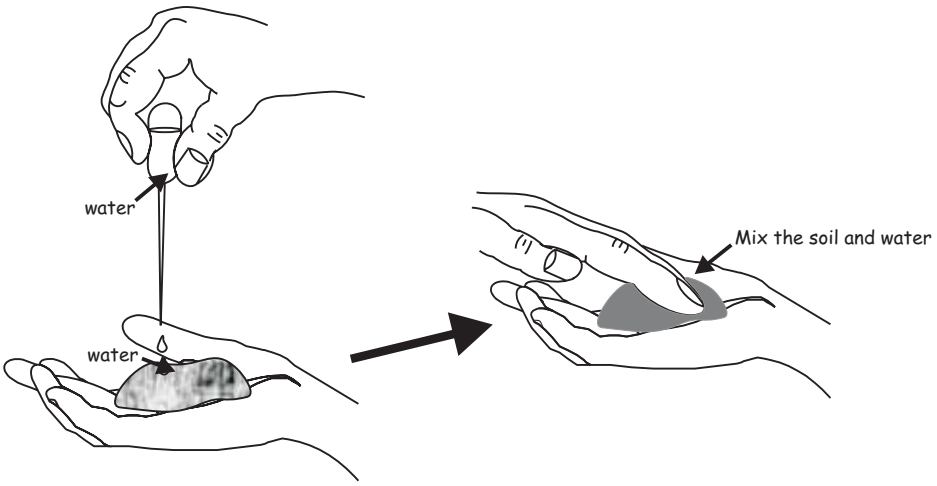
One person will work with the soil and the other person will use the identification key.

STEP 1



Take a handful of soil. Remove all the big stones and bits of sticks etc.

STEP 2



Keep the soil in your hand and add some water. Mix the soil and water well. If your mixture is too runny add a little more soil.

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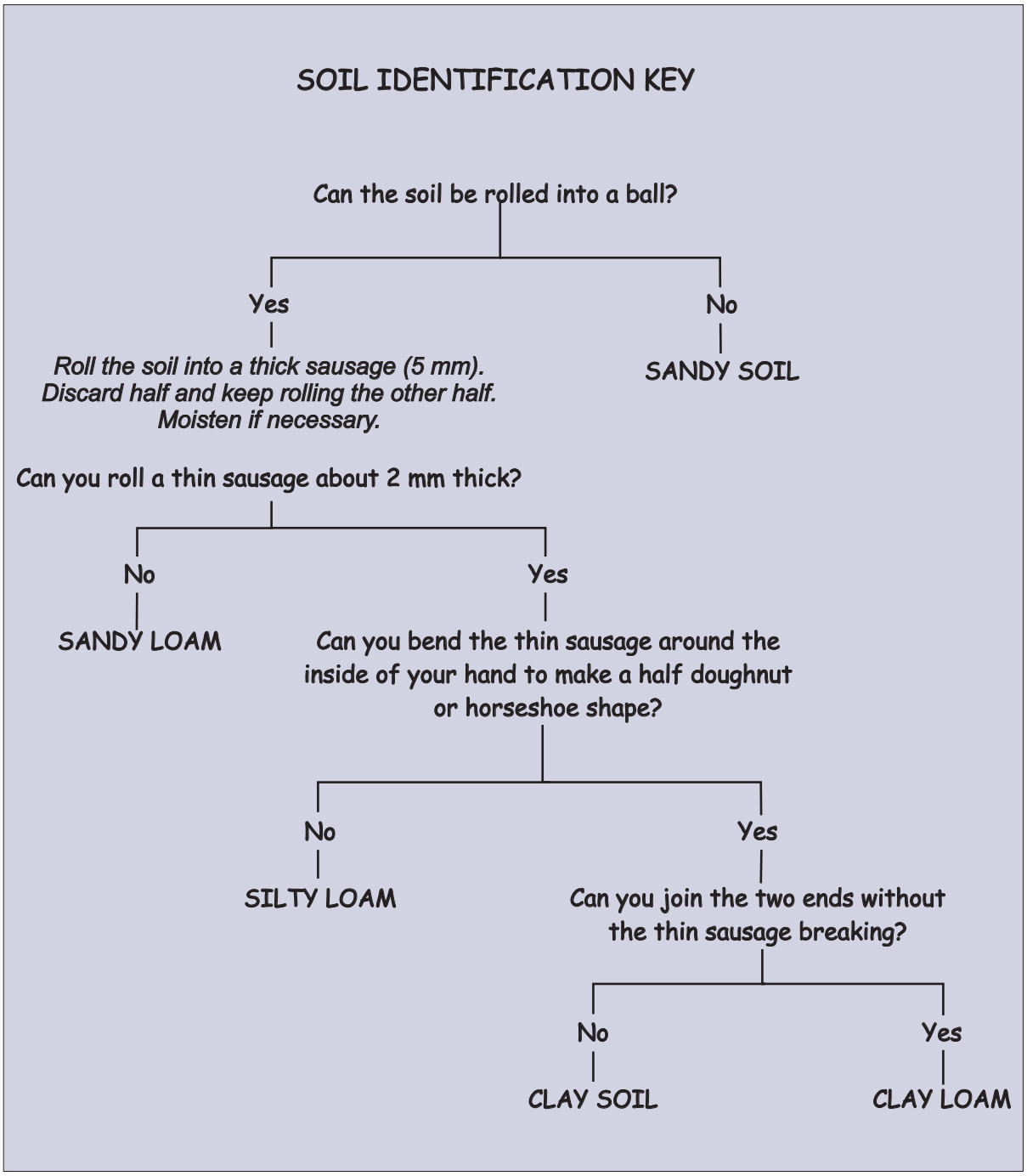
STEP 3

Use the key below to identify the type of soil in your hand.

STEP 4

When you have identified your soil, discuss with other groups in your class how many have the same type of soil as you. If any groups have different soil samples, how do they differ?



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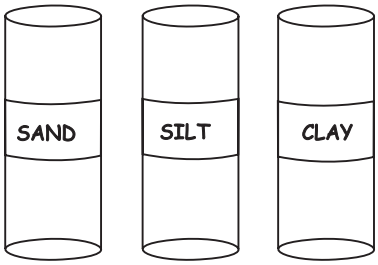
Activity 1.16 STUDYING SOIL TYPES

Focus Question: How different are the soil types?

You will need:

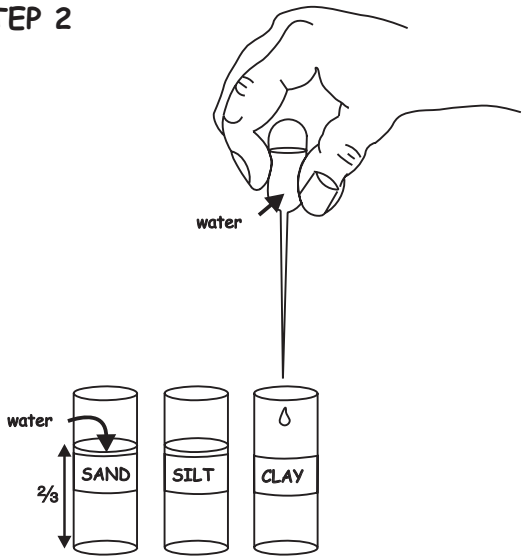
- 3 large sample vials
- sandy soil
- propettes
- clayey soil
- dish washing liquid
- silty soil

STEP 1



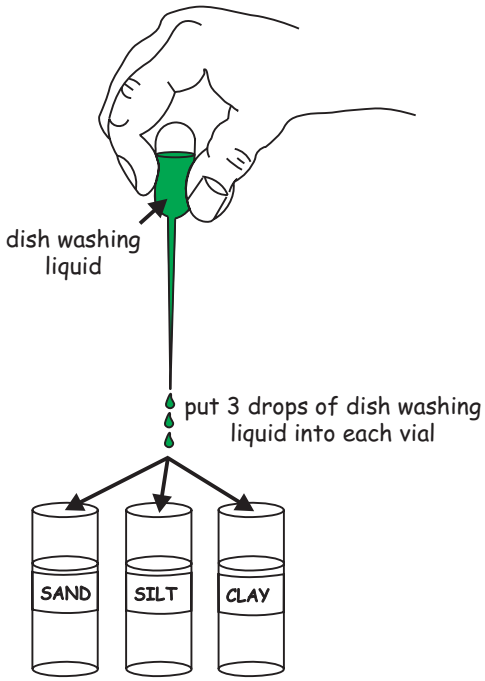
Label one vial sand, the second silt and the other clay using small pieces of labels.

STEP 2



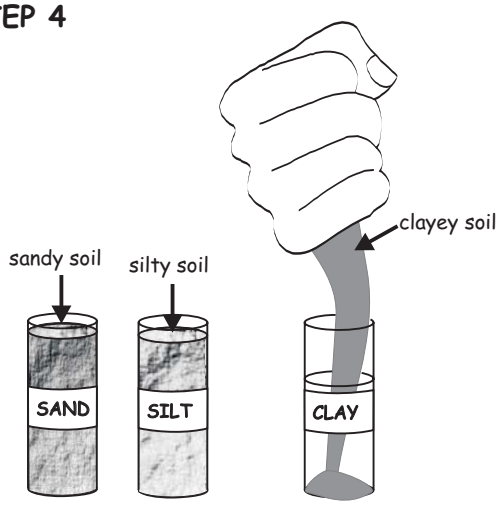
Use a propette to fill the three large vials equally to two thirds with water.

STEP 3



Add three drops of dish washing liquid into the water in each vial using a propette.

STEP 4



Add sandy soil to the soap mixture in the vial labeled sand to just about fill the vial. Repeat for clayey and silty soils respectively.

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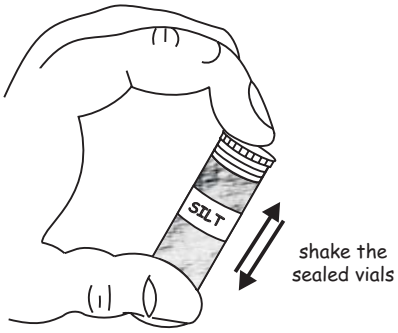
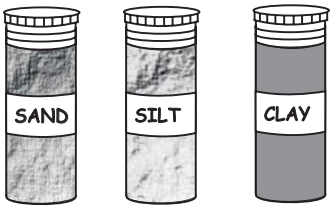
STEP 5



Close the three vials tightly with the lids and shake them well.

STEP 6

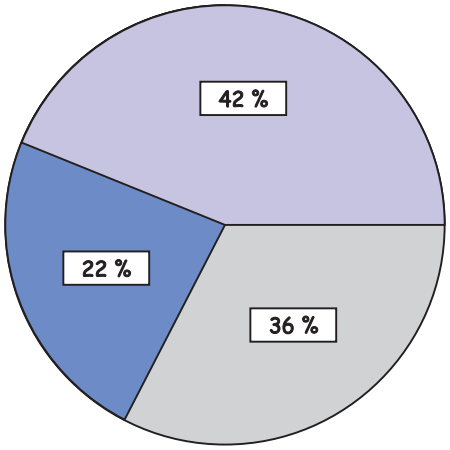


Put the vials in a place to stand overnight where they cannot be disturbed.

STEP 7

The next day, observe the vials without shaking.

Q1 Describe what you see.
Q2 Make a drawing of what you see.
Q3 Draw three pie charts like the one below, to represent your findings of the composition of sandy, clayey and silty soils.



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Activity 1.17 IS MY GARDEN SOIL ACIDIC OR BASIC?

Soil pH is important to know because it affects how plants absorb nutrients from the soil. A pH scale is used to measure whether substances are acidic, like a lemon, or basic (alkaline) like some batteries. There are different types of indicators which are used to determine this. The indicator used in this activity is called Litmus paper. It turns red (pink) in an acidic substance and blue in a basic substance. Different plants grow in soils of different pH level.

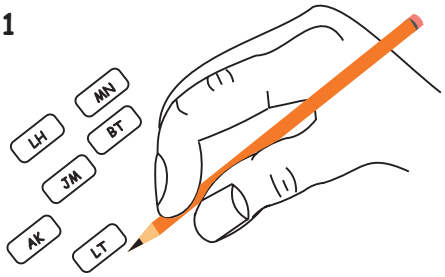
Focus Question: Is the soil sample acidic like lemons or basic like an oven cleaner?

You will need:

(to bring a sample of soil from your garden in a small sample vial)

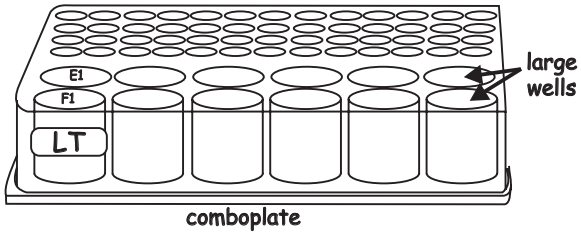
- comboplate
- propette
- labels
- soil samples
- microspatula
- 3 funnels
- water
- blue and red litmus paper strips

STEP 1



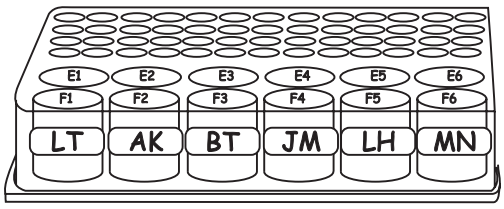
Work with five friends from your class by sharing soil samples. Write your initials (e.g LT for Lebo Taole) on one of the labels and the initials of your five friends each on a label.

STEP 2



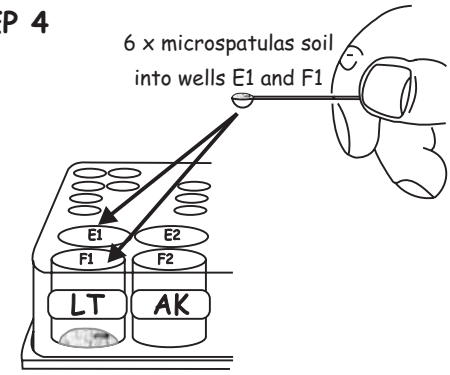
Put the label with your initials on the wall next to the first large well (F1) of the comboplate as shown in the picture.

STEP 3



Allocate the other labels to each of the remaining five wells by putting the labels on the side wall next to the wells.

STEP 4



Use a microspatula to put 6 scoops of soil from your sample into well F1 and another 6 scoops into well E1. Wipe the microspatula with a piece of toilet paper or cloth.

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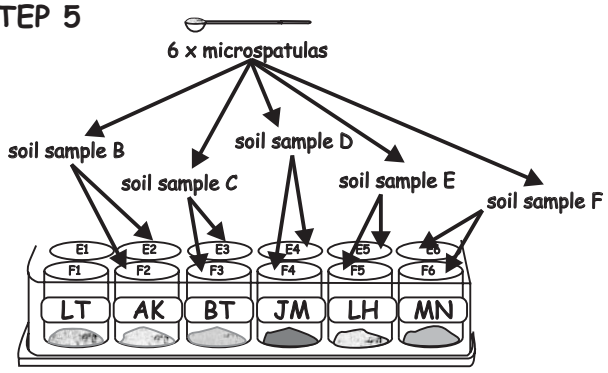
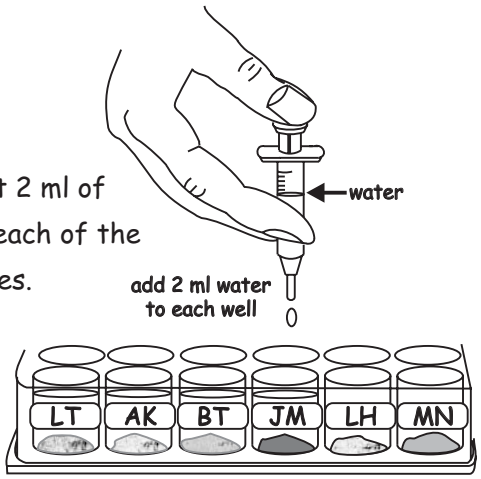
STEP 5



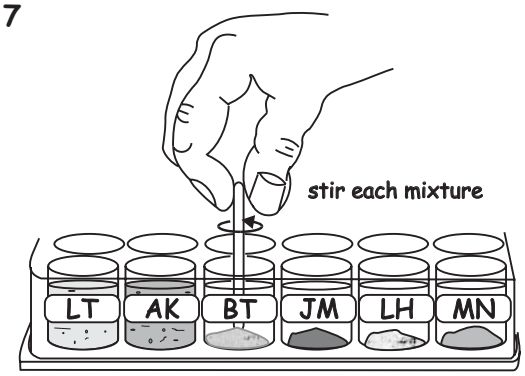
Repeat step 4 with the soil samples from your five friends, and let them also have their share in your soil sample.

STEP 6

Add about 2 ml of water to each of the soil samples.

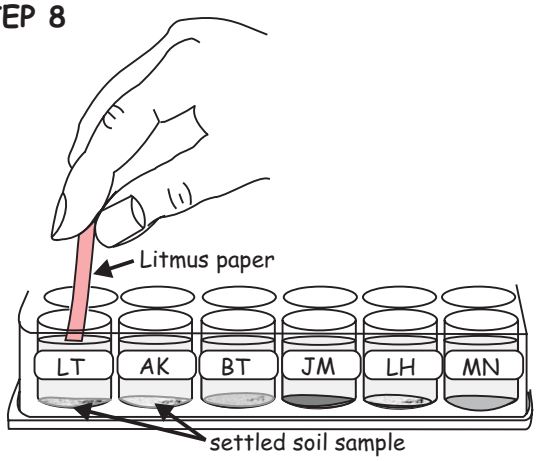


STEP 7



Stir each of the mixtures and leave them to stand until the soil has settled in each well.

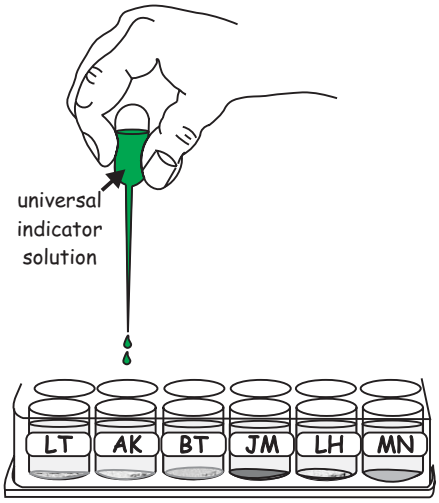
STEP 8



Test each soil mixture with a piece of red and a piece of blue Litmus paper. Draw a table like the one below and record your findings.

soil sample	colour with red litmus	colour with blue litmus	colour with indicator	pH	Acidic or Basic
A					
B					
C					
D					
E					
F					

STEP 9



Use a propette to add 1 to 2 drops of universal indicator to each mixture. Use the indicator chart to identify the pH of the soil samples. Record your findings in the table.

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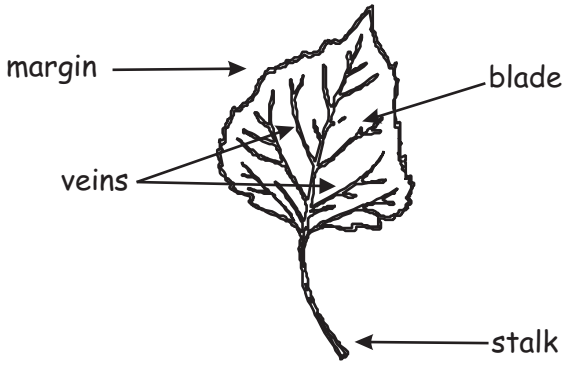
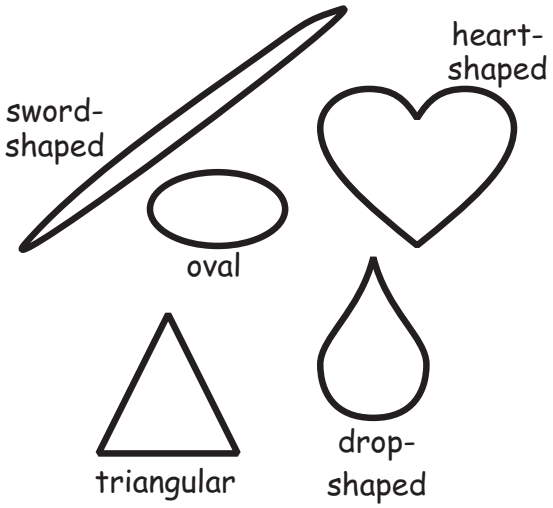
INTRODUCTION

Many plants have leaves.

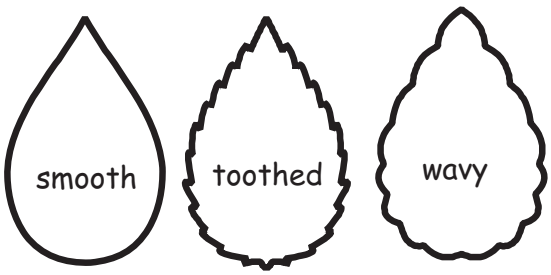
A leaf looks like this:



Leaves come in different shapes, like:



Leaf margins can be:



as well as other types

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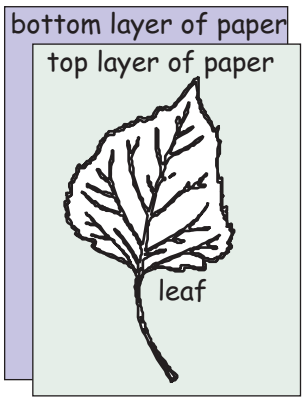
To study leaves you need:

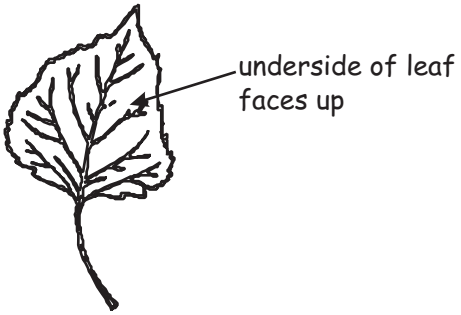
- some leaves from your home the school grounds or the roadside
- hand lens
- plain paper (old computer paper is good)
- wax crayons

What to do:

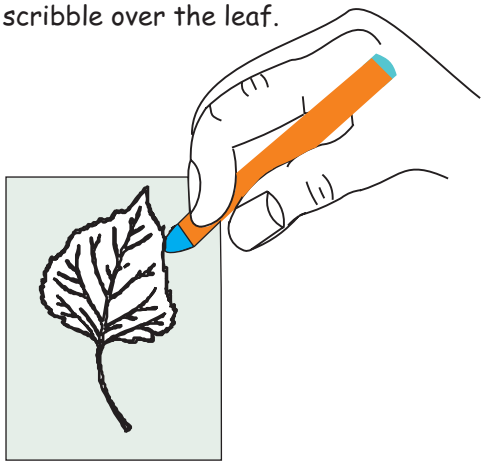
1. Place a leaf between two sheets of paper.



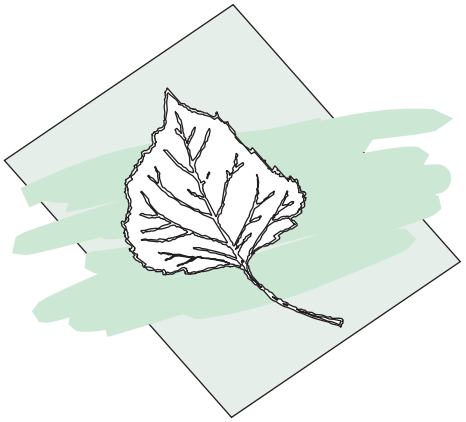
2. Keep the under side of the leaf up so that you can feel the veins.



3. Hold the paper steady and use the wax crayon to scribble over the leaf.



4. A leaf pattern will appear on the paper.



QUESTIONS

Q1 What is the shape of your leaf?

Q2 What is the margin like?

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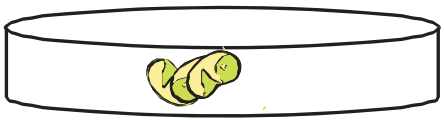
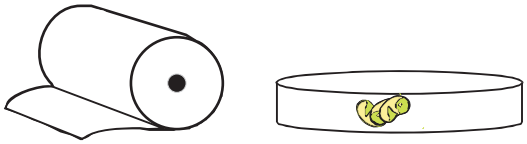
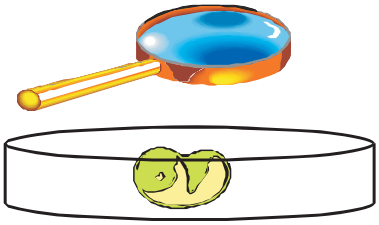
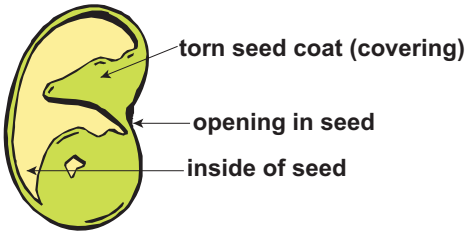
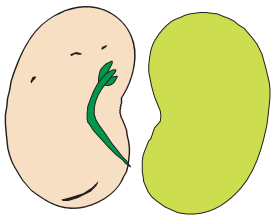
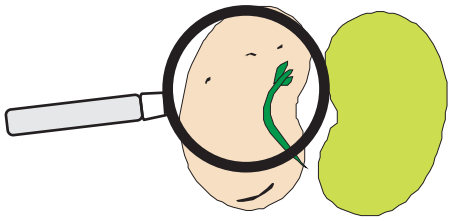
ACTIVITY 1.19 SEEDS

INTRODUCTION

Many plants produce seeds. These seeds grow into new plants.

To study a seed you need:

- petri dish
- a few dry bean seeds and pea seeds/lentil seeds
- water
- forceps
- hand lens
- paper towel

1. First soak the bean seeds in water in the petri dish for about a day. 	2. Remove the seeds, dry the dish and replace the seeds in the dried dish. 
3. Use the hand lens to look at one of the seeds. 	4. Find the labelled structures on your own seed. 
5. Use forceps to remove the torn seed coat. The seed breaks into two halves. 	6. Use the hand lens to look at the baby plant inside the seed. 

Q1 Make a drawing of the baby plant to show the young root and the young stem.

Q2 Plant a seed which you have not broken. Watch the seed every day for one to two weeks. Talk about what happens with your teacher, your friends and with other people.

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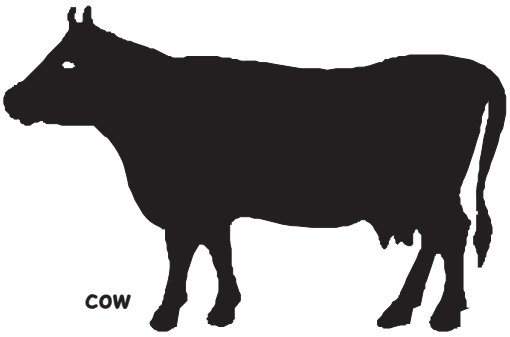
Activity 1.20 WHAT ARE FABRICS?

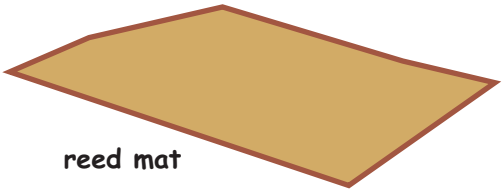
A fabric is a cloth which we use for clothing, sheets and blankets and other things.
Plants and animals provide many of the fabrics we use.

Part 1 Where do fabrics come from? A Linking Exercise

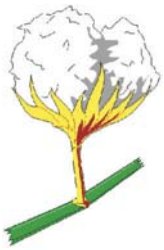
Draw lines to link the animal or plant with the article we can make from it.



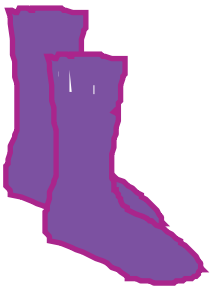
cow



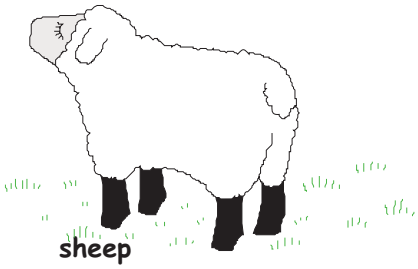
reed mat



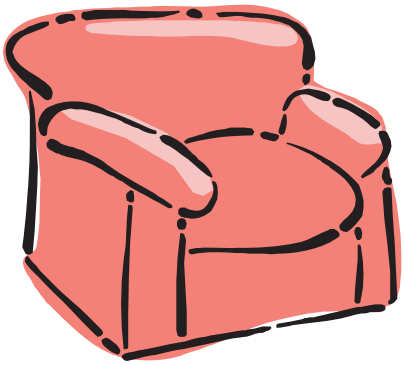
cotton plant



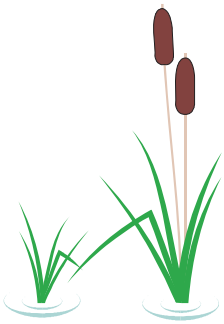
woollen socks



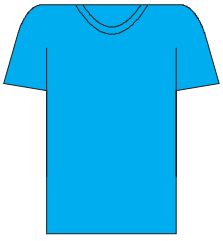
sheep



leather armchair



bulrushes



T-shirt

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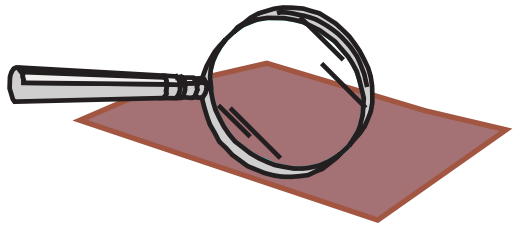
Part 2 What do fabrics look like?

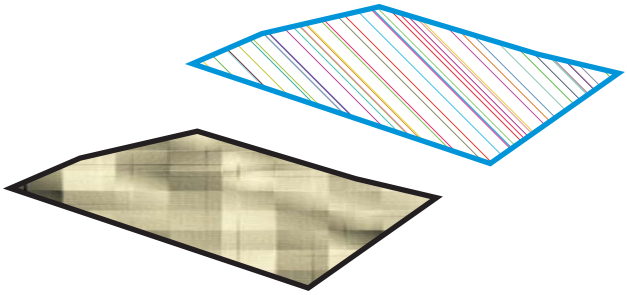
To look at fabrics you need:

- Different fabrics cut into small squares (about 3 cm x 3 cm)
- petri dish
- hand lens

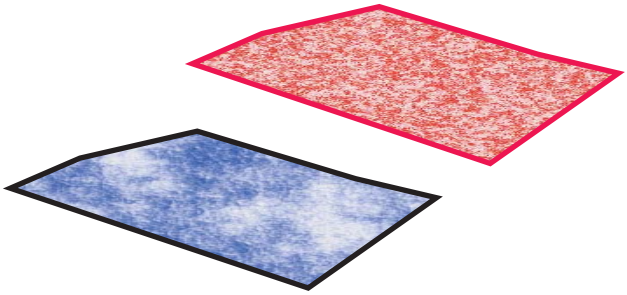
1. Look at some of the fabrics using a hand lens.



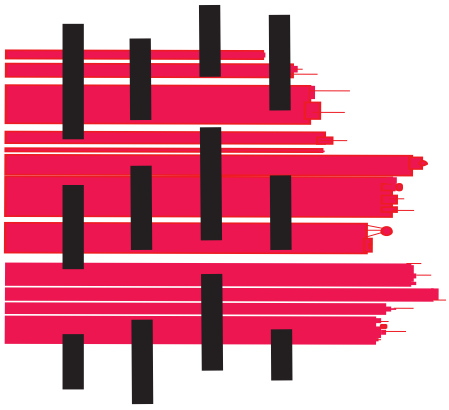
2. Choose fabrics which seem to be made of woven threads.



3. Place on one side those fabrics which do not seem to be made of woven threads. You may need these later.



4. Make drawings to show how each fabric is woven. eg.



Questions:

Q1 In which types of fabrics are the threads quite far apart?
Q2 In which types of fabrics are the threads closely woven?
Q3 In which types of fabrics are the threads the same distance apart?
Q4 In which types of fabrics are the threads all the same size?
Q5 In which types of fabrics are the threads all the same colour?

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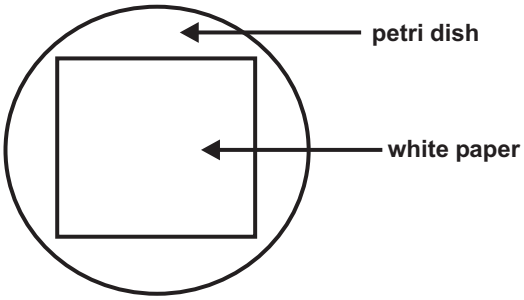
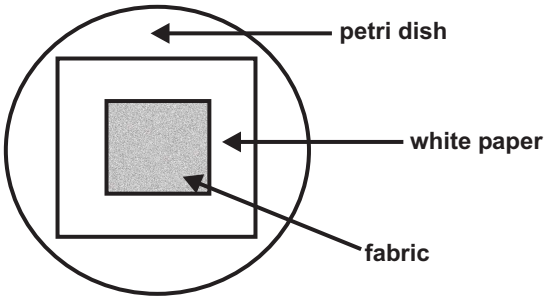
Part 3 Which fabrics stain easily?

To test fabrics for staining you need:
small pieces of fabrics (2 cm x 2 cm), small pieces of white paper (3 cm x 3 cm), propettes, inks or paints, petri dish, forceps.

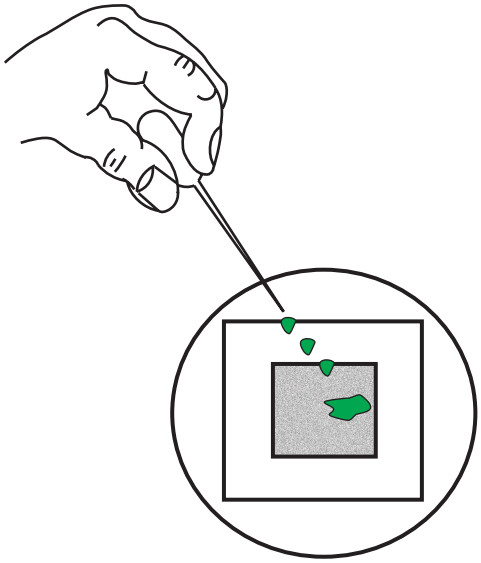
1 Place a piece of white paper in the petri dish.



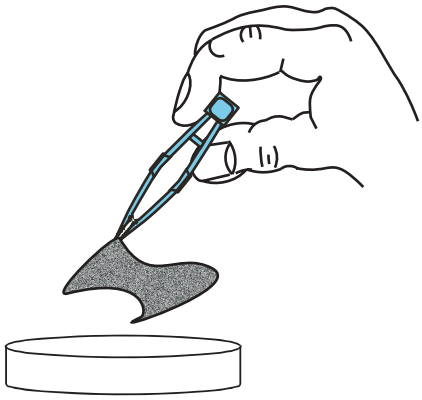
2 Place a piece of fabric on top of the paper in the dish.



3 Use a propette to place a few drops of ink or paint onto the fabric - **NOT ONTO THE PAPER**.



4 Use forceps to remove the fabric from the paper.



Carefully look at the fabric and at the white paper in the petri dish.

QUESTIONS

Q1 Did any of the ink or paint stay on the fabric?
Q2 Did any of the ink or paint go through the fabric?
Q3 Did any of the ink or paint stain the white paper?

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Repeat steps 1 to 4 with different types of fabrics. Use those which are made of woven threads AND those from Part 2 which did not seem to be made of woven threads. Answer questions 1 to 3 for each fabric. Write what you found in a table like the one below.

Fabric	1	2	3	4	5
Is it made of woven threads?					
Did the ink/ paint stay on the fabric?					
Did the ink/paint go through the fabric?					
Did the ink/paint stain the white paper?					

QUESTIONS (continued)

Q4 Which fabrics did not allow the ink or paint to pass through onto the white paper?

Q5 Which fabrics did allow the ink or paint to pass through onto the white paper?

Q6 Which fabrics do you think would make good aprons?

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